# Datex-Ohmeda

# AS/3 Compact Monitor, CS/3 Compact Monitor

# Technical Reference Manual

All specifications are subject to change without notice.

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Datex-Ohmeda Inc.
3 Highwood Drive
Tewksbury, MA 01876

Tel. (978) 640-0460 Fax (978) 640-0469
www.us.datex-ohmeda.com

Datex-Ohmeda Division,
Instrumentarium Corp.
P.O. Box 900, FIN-00031
DATEX-OHMEDA, FINLAND
Tel. +358 10 394 11 Fax +358 9 146 3310
www.datex-ohmeda.com

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## NOTICE

### Intended purposes

The Datex-Ohmeda AS/3 Compact Monitor is a multiparameter patient monitor intended for the physiological monitoring of hospitalized patients. It is indicated for monitoring anesthetized patient's relaxation, hemodynamic, ventilation, gas exchange, regional perfusion and neurophysiological parameters. The system is indicated for use by qualified medical personnel only.

The Datex-Ohmeda CS/3 Compact Monitor, CMC, is a multiparameter patient monitor intended for the physiological monitoring of hospitalized patients. It is indicated for monitoring the patient's hemodynamic, ventilation, gas exchange, regional perfusion and central nervous system. The system is indicated for use by qualified medical personnel only.

The Datex-Ohmeda CS/3 Compact Monitor with S-ICU99/A software is intended for multiparameter patient monitoring. The monitor is indicated for monitoring of hemodynamic (including arrhythmia and ST-segment analysis), respiratory, ventilatory, gastrointestinal/regional perfusion and neurophysiological status of all hospital patients. The system is indicated for use by qualified medical personnel only.

### Classifications

### In accordance with IEC 60601-1:

Class I and internal powered equipment- the type of protection against electric shock.
Type BF or CF equipment. The degree of protection against electric shock is indicated by a symbol on the parameter panel beside each connector.
Equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
Continuous operation according to the mode of operation.

### In accordance with IEC 60529:

Degree of protection against the harmful ingress of water as detailed in the IEC 60529: IPX1

### In accordance with EU Medical Device Directive: IIb

### Responsibility of the manufacturer

Datex-Ohmeda Division, Instrumentarium Corp. is responsible for the safety, reliability and performance of the equipment only if:

- assembly, operations, extensions, readjustments, modifications, service and repairs are carried out by personnel authorized by Datex-Ohmeda.
- electrical installation complies with appropriate requirements.
- the equipment is used in accordance with the User's Guide and serviced and maintained in accordance with the Technical Reference Manual.

### Storage and Transport

For allowed storage and transport conditions refer to the documentation delivered with the monitor.

### Trademarks

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# Datex-Ohmeda AS/3™ Compact Monitor and CS/3™ Compact Monitor

## Technical Reference Manual, 896 623

## Folder #1(2), PART I, General Service Guide


| Document No. | Updated | Updated | Description | |
|---|---|---|---|---|
| 896 623 | | | Introduction, System description, Installation, Interfacing, Functional check, General troubleshooting | 1 |
| 896674 | | | Planned Maintenance Instructions | 2 |


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# 1 INTRODUCTION

Datex-Ohmeda AS/3 Compact Monitor is a cardiac and respiratory monitoring device used during anesthesia, recovery and short transports.

Datex-Ohmeda CS/3 Compact Monitor is designed for monitoring in intensive care units.

The monitor consists of the CM frame and modules. There are single and double width modules containing one or more parameters. The modules can be removed and inserted during operation.

The CM frame is equipped with a battery, and also a built-in recorder is available. AS/3 Anesthesia Keyboard, K-ARK is available for AS/3 Compact Monitor.

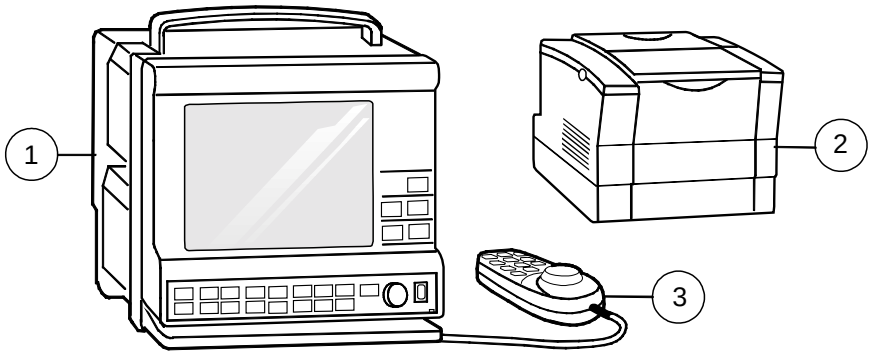



**Figure 1 AS/3, CS/3 Compact Monitor**

(1) CM Frame

(2) Printer

(3) Remote Controller, K-REMCO

# 1.1 Notes to the reader

This technical reference manual is intended for service personnel and engineers who will perform service and maintenance procedures on Datex-OhmedaAS/3 Compact Monitor and Datex-Ohmeda CS/3 Compact Monitor.

This technical reference manual is divided into two parts:

- The Part I gives to the reader overview of the AS/3 Compact Monitor and CS/3 Compact Monitor. This part of the manual contains also the information you need to unpack, install and test the monitors. Read the manual through and make sure that you understand the procedures described before installation of the monitor. To avoid risks concerning safety or health, strictly observe the warning indications. If you need any assistance concerning the installation, please do not hesitate to contact your authorized distributor.
- The Part II gives detailed descriptions of each component of Compact Monitor.

The manufacturer reserves the right to make changes in product specifications without prior notice. The information in this manual is believed to be accurate and reliable; however, the manufacturer assumes no responsibility for its use.

Datex-Ohmeda assumes no responsibility for the use or reliability of its software on equipment that is not furnished by Datex-Ohmeda.

## 1.1.1 Related Documentation

### AS/3 Compact Monitor

More information about the clinical aspects and technical background:
AS/3 Compact Monitor, User's Guide
AS/3 Compact Monitor, User's Reference Manual

Default configuration options: Default Configuration Worksheet
Circuit diagrams, component lay-out pictures, etc.: Schematic Diagrams

More information about other devices closely related to the Compact Monitor:
Information Center, User's Reference Manual
AS/3 Record Keeper, User's Reference Manual

### CS/3 Compact Monitor

More information about the clinical aspects and technical background:
CS/3 Compact Monitor, User's Guide
CS/3 Compact Monitor, User's Reference Manual

Default configuration options: Default Configuration Worksheet
Circuit diagrams, component lay-out pictures, etc.: Schematic Diagrams

More information about other devices closely related to the Compact Monitor:
Information Center, User's Reference Manual
CS/3 Arrhythmia Workstation, User's Reference Manual

### 1.1.2 Conventions used

Throughout this manual, the following conventions are used to distinguish procedures or elements of text:

Sign the performed procedure in the check list.

To help you find and interpret information easily, the manual uses consistent text formats for certain text types:

**Hard Keys** Names of the hard keys on the Remote Controller, Command Board and modules are written in the following way: **Cancel.**

***Menu Items*** Menu items are written in bold italic typeface, for example ***Location.***

'Messages' Messages (alarm messages, informative messages) displayed on the screen are written inside single quotes, for example 'Learning'.

*Chapters* When referring to different sections in this manual, section names are written in italic typeface and enclosed in double quotes, for example *"Cleaning and Care"*.

**WARNING** **Warnings are written in bold D-0 Sans typeface. The font size is 13 points. The word warning itself is written in capitals.**

CAUTION The font size is 13 points. The word caution itself is written in capitals.

NOTE: Notes are written like this using Bodytext.

### Symbols on transport packaging

The contents of the transport package are fragile and have to be handled with care.

This symbol indicates the correct upright position of the transport package.

The transport package must be kept in a dry environment.

This symbol is to indicate the temperature limitations within which the transport package should be kept and handled.

### Symbols on equipment

Ni-Cd

This battery contains Ni-Cd and in case of disposal, must be separated from other waste according to local regulations.

This battery contains Ni-Cd and it can be recycled.

Dangerous voltage

When using the ARK Barcode Reader, N-SCAN, do not stare into beam. The N-SCAN Barcode Reader is a Class 2 laser product.

Attention, consult accompanying documents.

When displayed beside the $O_2$ value, indicates that $FiO_2$ low alarm limit is set below 21 %.

When displayed next to the HR value, indicates that the pacer is set on R or a wide QRS is selected.

On the Interface Module M-INT, indicates that it is for connecting external devices. Do not connect patient cables to the module.

On the rear panel of the monitor indicates the following warnings and cautions:

- Electric shock hazard. Do not open the cover or the back. Refer servicing to qualified personnel.
- For continued protection against fire hazard, replace only with same type and rating of fuse.
- Disconnect power supply before servicing.

Type BF (IEC-601-1) protection against electric shock

Type BF (IEC-601-1) defibrillator-proof protection against electric shock

Type CF (IEC-601-1) protection against electric shock

Type CF (IEC-601-1) defibrillator-proof protection against electric shock

Gas outlet (in airway gas models only)

Ethernet connectors

When displayed on the upper left corner of the screen, indicates that the alarms are silenced. When in the menu or digit fields, indicates that the alarm source has been turned off.

## Other Symbols

Equipotentiality. Monitor can be connected to potential equalization conductor.

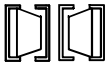
Alternating current

Fuse

**SN, S/N** Serial Number

Sub menu. Selecting an alternative with this symbol in a menu opens a new menu.

The monitor is connected to the Datex-Ohmeda Network.



Data card (green) and/or the Menu card (white) is inserted.

Indicates the beats detected.

Respiration rate is measured using impedance respiration measurement.

## 1.2 Safety Precautions

### 1.2.1 Warnings

**WARNING** **A WARNING indicates a situation in which the user or the patient may be in danger of injury or death**

#### Power Connection

- Before connecting the power cord to the mains outlet, check that the local voltage and frequency rating corresponds with the rating stated on the device plate on the rear panel of monitor frame.
- Connect the monitor to a three-wire, grounded, hospital grade receptacle. Do not remove the grounding prong from the power plug.
- Use intact power cord. Replace the cord if it is cracked, frayed, broken or otherwise damaged.
- Do not apply tension to the power cord. The cord may get broken.
- Do not use extension cords or adapters of any type.

#### External Connection

- Do not connect any other external devices to the monitor than those specified by Datex-Ohmeda.

#### Fuse Replacement

- Replace the fuse with a fuse of the same type and with the same rating.

#### Explosion Hazard

- Do not use the monitor in the presence of flammable anesthetics.

#### Patient Safety

- Do not perform any testing or maintenance on the monitor while it is being used on a patient.
- Use only cables and accessories approved by Datex-Ohmeda. Do not modify them. Other cables and accessories may damage the monitor or interfere with measurement.
- PACEMAKER PATIENTS: The impedance respiration measurement may cause rate changes in Minute Ventilation Rate Responsive Pacemakers. Set the pacemaker rate responsive mode off or turn the impedance respiration measurement off on the monitor.

### Cleaning and Service

- Only trained personnel with proper tools and test equipment should perform the tests and repairs described in this manual. Unauthorized service may void the monitor warranty.
- Switch the power off and unplug the power cord before cleaning or service. Get rid of moisture completely before reconnecting it to the mains outlet.
- Do not touch any exposed wire or conductive surface while covers are off and the monitor is energized. The voltages present can cause injury or death.
- Perform electrical safety check and leakage current test to the monitor always after service.

## 1.2.2 Cautions

CAUTION A CAUTION indicates a condition that may lead to equipment damage or malfunction.

### Installation

- Leave space behind the monitor to allow proper ventilation.

### Before Use

- Allow two minutes for warm-up and note any error messages or deviations from normal operation.
- Clean side panel fan dust filter once a month or whenever necessary.

### Autoclaving and Sterilizing

- Do not autoclave any part of the monitor.
- Do not gas sterilize the modules.

### Cleaning and Service

- Do not use ammonia-, phenol-, or acetone-based cleaners. These cleaners may damage the monitor surface.
- Do not immerse the monitor in any liquid. Do not allow liquid to enter the monitor or into modules.
- Electrostatic discharge through the PC boards may damage the components. Before replacing PC boards, wear a static control wrist strap. Handle all PC boards by their non-conductive edges and use anti-static containers when transporting them.
- Do not break or bypass the patient isolation barrier when testing PC boards.

## Special Components

- There are special components used in this monitor which are vital to assure reliability and safety. Datex-Ohmeda assumes no responsibility for damage if replacement components not approved by Datex-Ohmeda are used.

- There is a lithium battery on the CPU board. Discard broken IC containing the battery according to local regulations.

## Batteries

The battery package of the power supply unit in this device contains NiCd which is hazardous to environment and thus the battery needs to be disposed of carefully according to local regulations.

To replace the batteries safely, please refer to the instructions further on in this manual.

- Do not short-circuit the battery terminals, short-circuiting the battery may produce a very high current, which damages the battery.
- Do not dispose of the battery into open flame, nor put the battery near fire, as it may explode.
- Do not disassemble the battery. It contains electrolyte, which may damage clothing or cause injury to skin or eyes. If exposed to electrolyte, wash the injured area with plenty of water and contact a doctor.

See also the chapter “Symbols”.

## Storage and Transport

Do not store or transport the monitor outside the specified temperature and pressure range:

| | |
|---|---|
| Temperature | -10...+50 °C /14...122 °F |
| Ambient pressure | 660...1060 hPa/500...800 mmHg/ |
| | 660...1060 mbar |
| Humidity | 0...85 % non-condensing |

## Discard

Discard the device and parts thereof according to local regulations. Do not discard to the nature.

The manufacturer accepts no responsibility for any modifications made to the monitor outside the factory.

# 2 SYSTEM DESCRIPTION

## 2.1 Introduction

Datex-OhmedaAS/3 and CS/3 monitors builds up to freely configurable modular system. The architecture is designed to enable different module combinations so that the user is able to get the desirable parameter and feature set. The modular approach makes it possible to add new features when they are needed.

## 2.2 Bus structure

The operation of Datex-OhmedaAS/3 and CS/3 products is based on two communication channels, the **CPU bus** and the **module bus**. All boards connected to the CPU bus as well as the parameter modules attached to the module bus receive their power from the same power supply, which is an integral part of the frame.

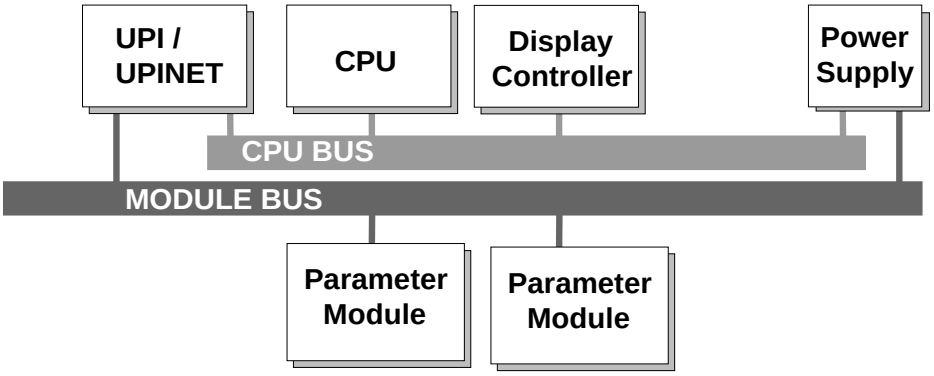



**Figure 2 General Structure of AS/3 and CS/3 System**

The CPU bus is a parallel communication channel used only for internal data transfer between the boards connected to one frame. It is based on the ISA bus used in the IBM PC computers. Data is transferred on this 16 bits wide bus using the CPU clock frequency.

The module bus is used to connect the parameter modules to the frame. It based on the widely used industry standard RS-485, which uses differential serial method to transfer the data. This type of bus is quite robust and it allows the modules to be attached or detached when the power is on.

The RS-485 type serial communication supports so called multidrop or party line connections. This means that all modules connected to module bus are using the same two physical wires for communication purposes. The advantage is, that all the module bus connectors are identical and the modules can be connected to any order and position.

Module bus is using 500 kbps data transfer rate and it can be used for longer distances than the CPU bus, e.g. for external-frame connections.

## 2.3 Distributed processing

A system put together from AS/3 and CS/3 products is a multiprocessor system. All the modules have their own microprocessor and they are doing the low-level functions such as module key control, waveform filtering, pneumatic control, etc. At the same time the main CPU is doing higher level tasks, e.g. trending and alarm control. While modules and CPU are doing their job, the UPI processor takes care of all functions needed to transfer the data between modules and CPU. And at the same time the processor on display control board is doing pixel calculations for graphics.

This kind of parallel processing gives one major advantage to centralized processing. Each time new modules or boards are added to the system, the processing power is also increased. As a result the system is not slowing down when new features are added.

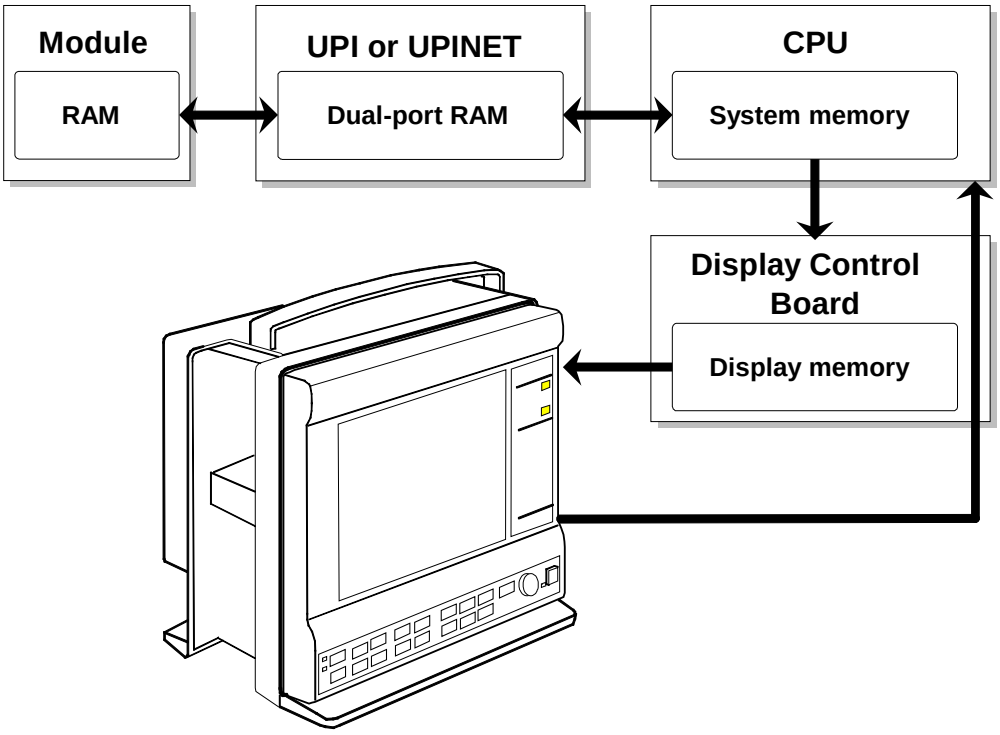



**Figure 3 Distributed Processing in AS/3 and CS/3 System**

## 2.4 Module communication

The communication master controlling the data transfer between CPU bus and module bus is called UPI (Universal Peripheral Interface) board. It sends information or questions to each module 100 times per second, and if the module is present it replies to each question immediately by sending a data package back to UPI board. This communication protocol ensures that each module receives and sends information every 10 ms, the package length depends on the module type. If the module does not respond, the UPI presumes that the module is not connected.

Each module type has a unique name, which UPI uses to address its messages. If there are two modules of the same type, they both answer at the same time. This results an error and thus two similar modules are not allowed in one frame.

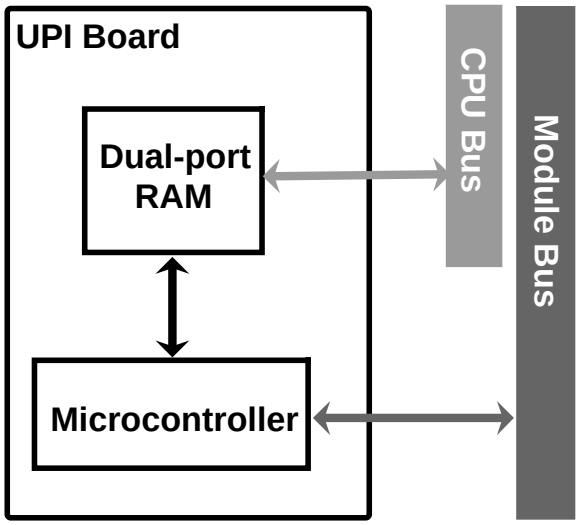



**Figure 4 Principle of UPI operation**

The microprocessor on the UPI board collects all information coming from the modules into a dual-port RAM. This memory is located on UPI board and it is mapped directly to the address space of the main CPU. The main CPU is thus reading information from it's own memory and UPI guarantees that the data is up to date. This operation works also to the other direction, when CPU is filling the dual port RAM with data and UPIs' microprocessor is distributing it to the modules.

## 2.5 Software loading

The Software Cartridge attached to the B-CPU2/3 board contains the program for the CPU board as well as for some other boards attached to the CPU bus. When the system is turned on, all processors load their part of the software from the cartridge and after that start to execute their program.
The CPU Board, B-CMCPU4 contains no external software cartridge. The softwares are always loaded on the B-CMCPU4 boards already at the factory. For service procedures B-CMCPU4 boards has a PC card drive, through which the software is loaded permanently on the board from the software card.

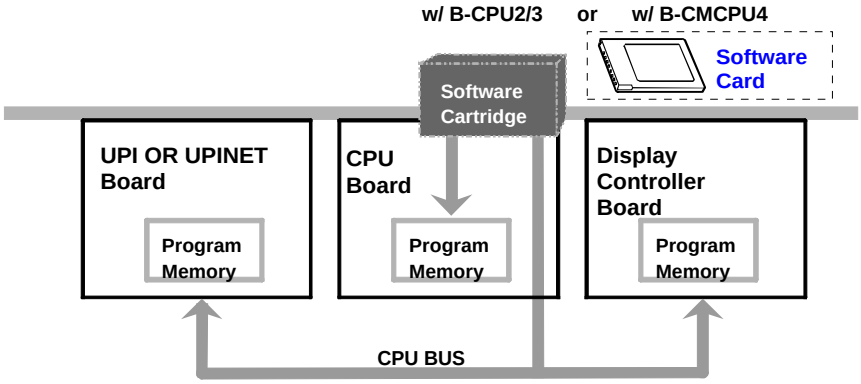



**Figure 5 Software loading**

## 2.6 Parameter modules

The detailed structure of the parameter modules depends on the specific needs for each individual parameter. Some common parts can be found inside the modules, however. The electronics inside the module is usually divided into isolated (floating) and non-isolated sections. Typically the non-isolated part consists only buffers needed to interface the module to module bus, the rest of the electronics can be found from the isolated side. This includes the microcontroller together with memory components, the front end analog electronics (amplifiers, etc.) and peripheral drivers to control LEDs, sensors, valves and pumps.

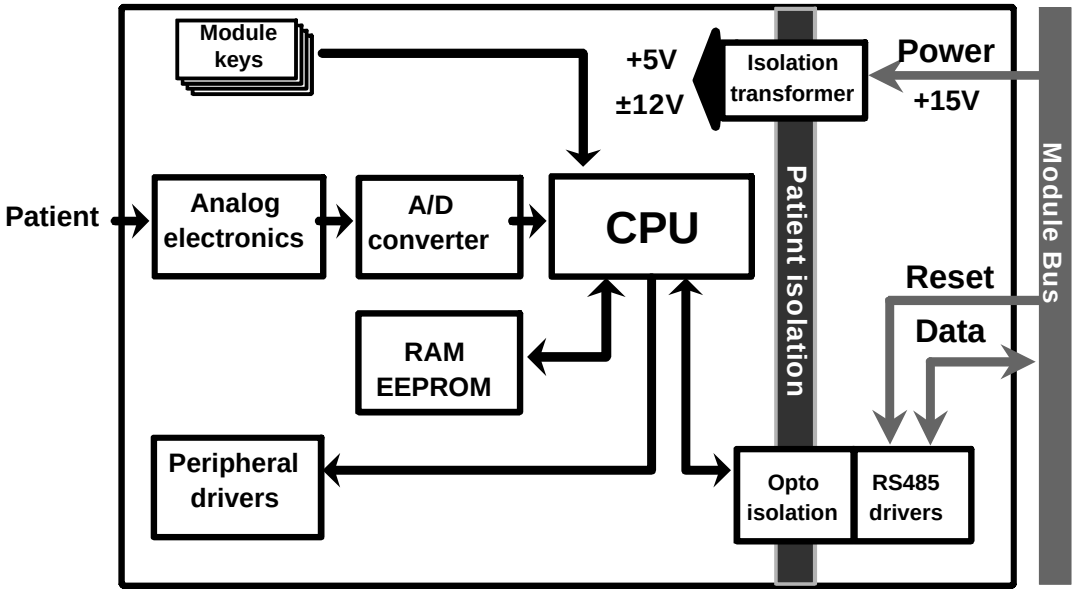



**Figure 6 General structure of parameter modules**

# 3 SYSTEM INSTALLATION

## 3.1 Unpacking instructions

1. Confirm that the packing box is undamaged. If the box is damaged, contact the shipper.
2. Open the top of the box and carefully unpack all components.
3. Confirm that all components are undamaged. If any of the components is damaged, contact the shipper.
4. Confirm that all components are included. If any of the components is excluded, contact your Datex-Ohmeda distributor.

## 3.2 Choosing location

Consider the following aspects:

- Lighting
- Space
- Connections
- Electromagnetic and radio frequency interference
- Atmosphere

## 3.3 Assembling the AS/3, CS/3 Compact Monitor Frame

Mounting of the Compact Monitor to the Compact Monitor Bed Mount or Wall Mount is described in a separate instruction sheet delivered with the mount.

### 3.3.1 Compact Monitor connections

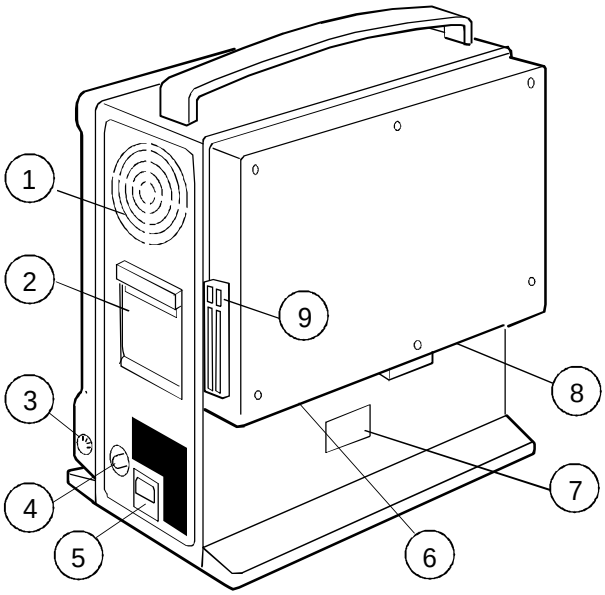



**Figure 7 AS/3 Compact Monitor Connections**

(1) Dust filter

(2) Recorder (optional)

(3) Connector for Remote Controller, Anesthesia Keyboard (K-ARK) and Bar Code Reader

(4) Potential equalization

(5) Mains power inlet

(6) Network connectors on B-NET/B-CMNET (optional)

(7) Device plate with voltage information

(8) Network connectors on B-UPINET/B-UPI (optional)

(9) Insertion slots for memory cards (optional)

### 3.3.2 Rear panel connectors

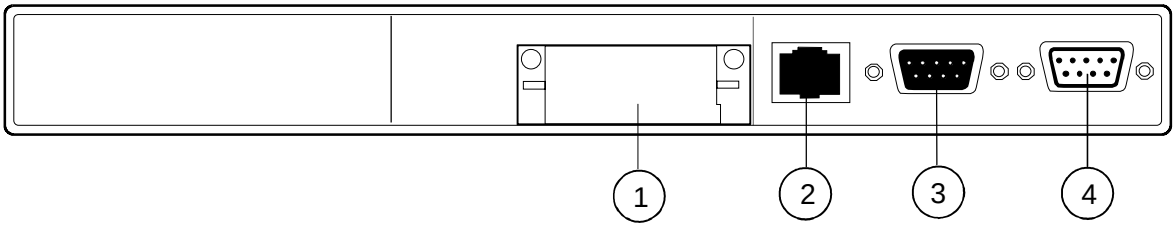



**Figure 8 Rear Panel with Memory, CPU and UPINET Boards**

(1) Software Cartridge, on CPU board, B-CPU2 or B-CPU3, or Software Card drive and lid for back plate on B-CMCPU4, connector on B-CMCPU4 is reserved for future use (not in figure).

(2) Network connector

(3) Network identification plug connector

(4) Serial communication connector

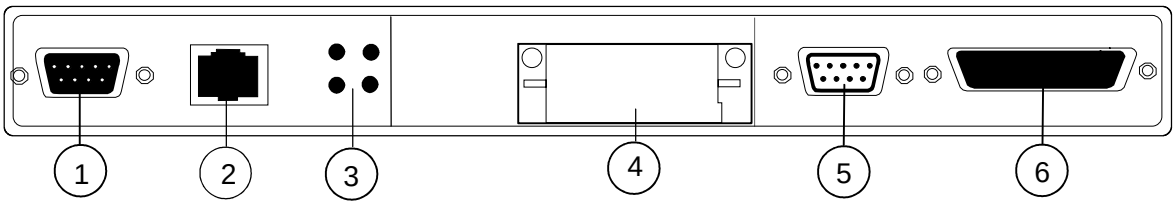



**Figure 9 Rear Panel with NET, CPU and UPI Boards. NET and UPI Boards can be replaced by UPINET board.**

(1) Network identification plug connector

(2) Network connector

(3) Ethernet status LEDs

(4) Software Cartridge, on CPU board, B-CPU2 or B-CPU3, or Software Card drive and lid for back plate on B-CMCPU4, connector on B-CMCPU4 is reserved for future use (not in figure).

(5) Serial communication connector

(6) Parallel printer port, analogue & digital input/output connector

CAUTION Turn the power off before making any rear panel connections.

**NOTE**: Your monitor configuration may not include all circuit boards listed above.

### 3.3.3 Connection to mains

Connect the power cord to the mains power inlet on the side of the monitor and to the wall socket.

**WARNING** **The power cord may only be connected to a three-wire, grounded, hospital grade receptacle.**

### 3.3.4 Connection to Network

To connect your monitor to Datex-Ohmeda Network, make sure you have a network board B-NET or B-UPINET installed.

Use the Monitor-Network cable to connect the monitor to the network.

1. Make sure that the power is turned off.
2. Connect the one of RJ-45 connectors to the connector and the Identification Plug to X2 connector on the network board.
3. Connect the other RJ-45 connector to the corresponding connector on the wallbox.
4. Turn on the power. Confirm that the network symbol and 'Connected to Network' message are displayed on the upper part of the screen.

**NOTE:** The network symbol will not be displayed if the battery symbol is displayed on the upper part of the screen.

### 3.3.5 Inserting the parameter modules

Insert each plug-in parameter module into a module slot. Firmly press the module in position.

**NOTE:** Do not use two or more modules with identical functions in the monitor. Take special care of this when using the extension frame.

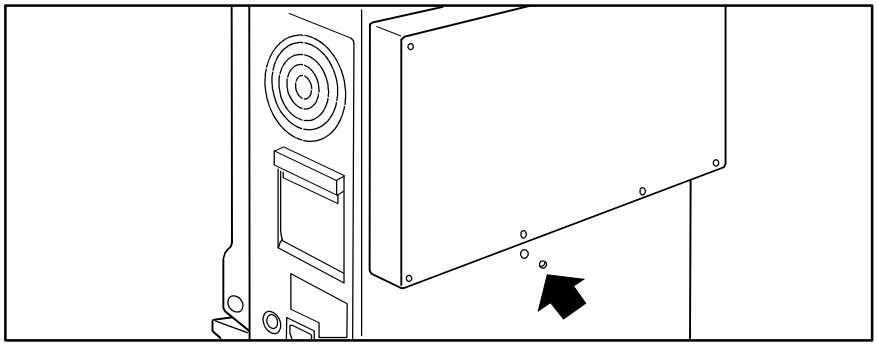
Modules with identical functions are:

- Haemodynamic multiparameter modules: M-ESTPR, M-ETPR, M-ESTR, M-NESTPR, M-NETPR, M-NESTR, M-NE12STPR, M-NE12TPR and M-NE12STR
- Pressure Modules: M-P, Pressure Temp Module, M-PT
- Cardiac Output Modules: M-COP and M-COPSv
- NIBP Modules: M-NIBP, M-NESTPR, M-NETPR, M-NESTR, M-NE12STPR, M-NE12TPR and M-NE12STR
- Airway Modules: M-C, M-CO, M-COV, M-CAiOV, M-CAiO and M-CAiOVx
- The Recorder Module, M-REC and the built-in recorders in F-CMREC or F-CMCREC may not be used simultaneously.

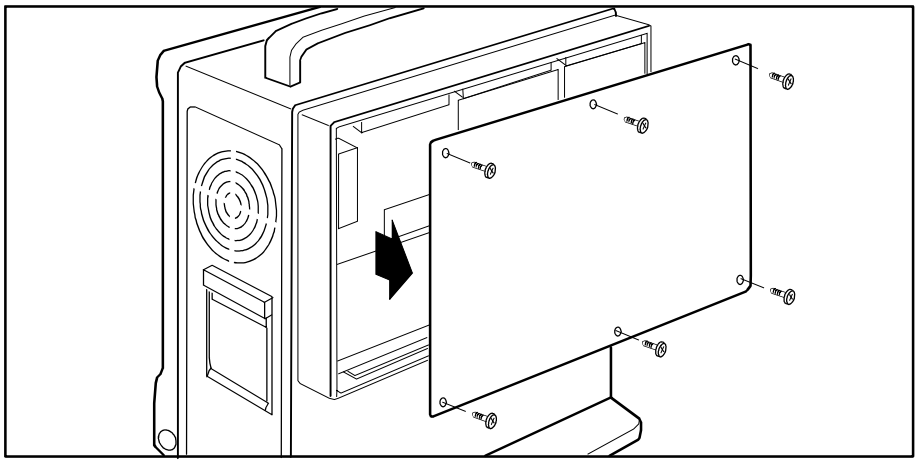
### 3.3.6 Replacing the CPU Board, B-CMCPU4

In case of service procedures (empty B-CMCPU4 and service software on PCMCIA card) refer the slot of CM Frame, CPUs and Softwares; Part II/1.

1. Make sure that the power is turned off on the Compact Monitor and unplug the power cord. Press and hold the service reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



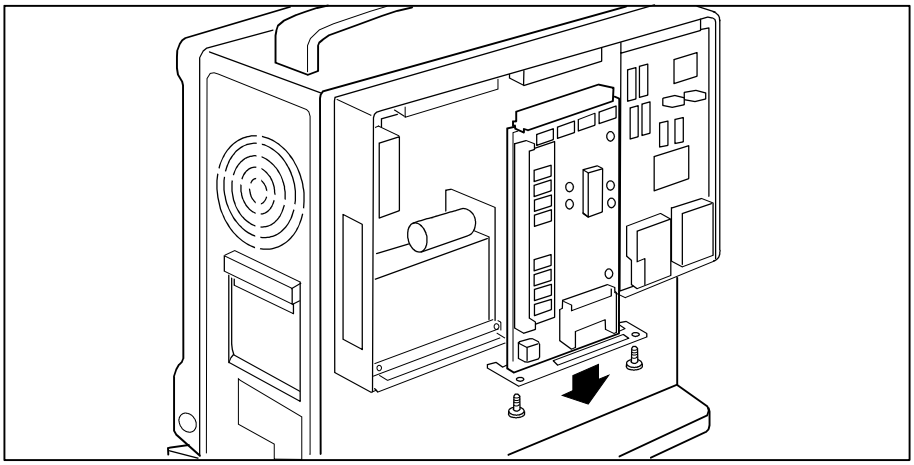
2. Unscrew the six screws holding the back plate in position and remove the plate.



**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Before you can remove the B-CMCPU4 board you have to remove boards next to it (B-UPI/B-UPINET and B-NET/B-CMMEM). Refer instructions in this same chapter.
4. Unscrew the screws holding the B-CMCPU4 board in position and remove the board.



5. Remove the CPU board from the protective anti static packaging. Always hold the board by the edges and wear a wrist grounding strap.

CAUTION The CPU Board comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

6. Insert the new CPU Board into the empty slot and firmly press the board in position.
7. Replace PC boards removed earlier and secure the boards.
8. Attach the back plate removed earlier.
9. Reconnect the Power Cord and turn the power on.
10. Perform factory reset.

### 3.3.7 Performing Factory Reset

**NOTE:** The factory reset is necessary after replacing software and after replacing CPU board.

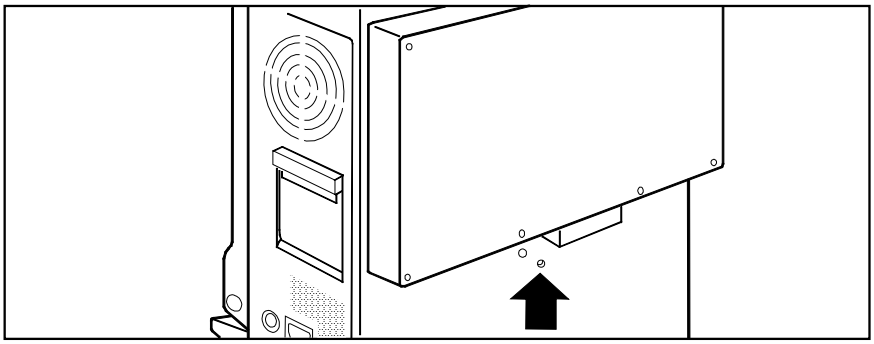
**NOTE:** The factory reset will restore all your customized defaults, including language selection, to factory defaults.

1. Press the **Monitor Setup** key.
2. Select ***Install/Service*** and password (16-4-34).
3. Select ***Service*** and password (26-23-8).
4. Select ***Set/ Test*** and perform factory reset.

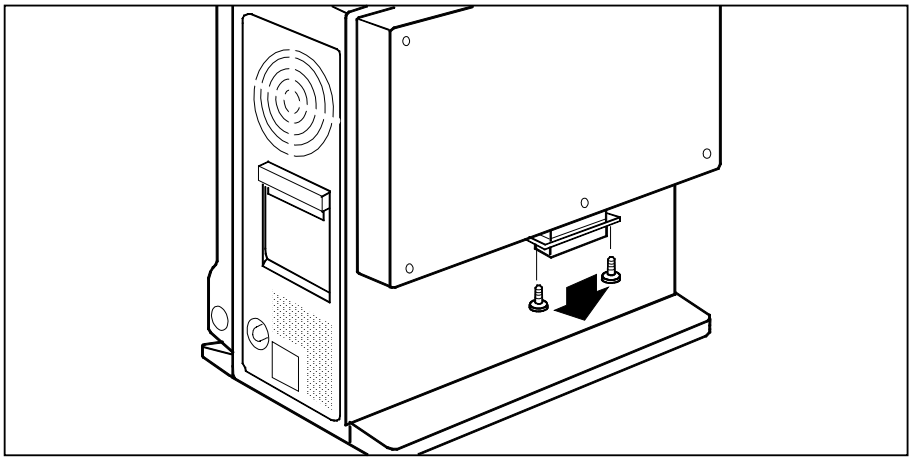
### 3.3.8 Replacing the Software Cartridge of B-CPU2/3

**NOTE:** All user settings will be lost after replacing the software cartridge.

1. Make sure that the power is turned off on the Compact Monitor and unplug the power cord. Press and hold the service reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



2. Unscrew the two screws holding the software cartridge in position and remove the cartridge.

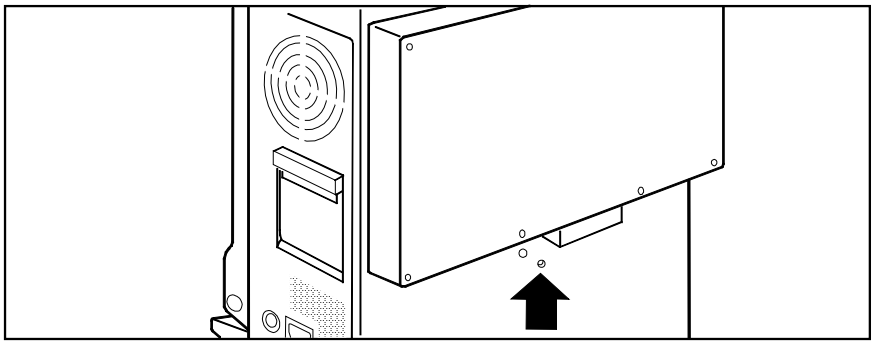


3. Insert the new software cartridge into the empty slot and firmly press the cartridge in position. Secure the cartridge (two screws).
4. Reconnect the power cord.
5. Perform factory reset.

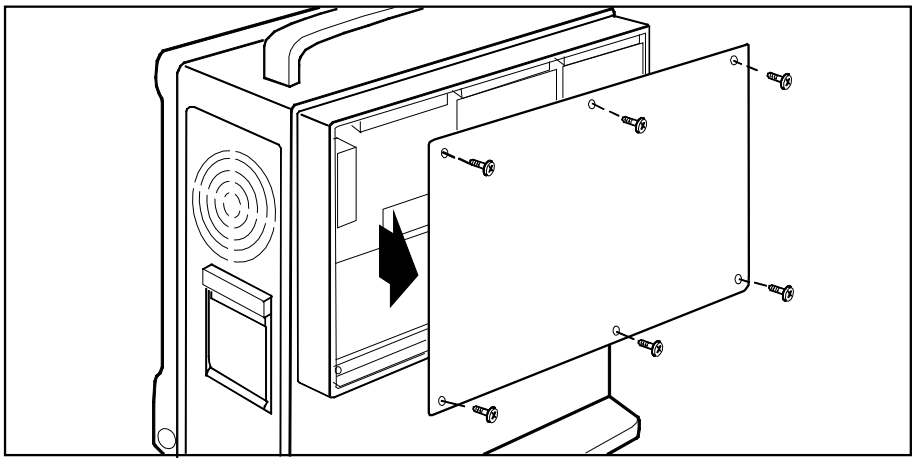
**NOTE:** After changing the software cartridge the start-up time is considerably longer when the monitor is started for the first time.

### 3.3.9 Replacing the CPU Board, B-CPU2/3

1. Make sure that the power is turned off on the Compact Monitor and unplug the power cord. Press and hold the service reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



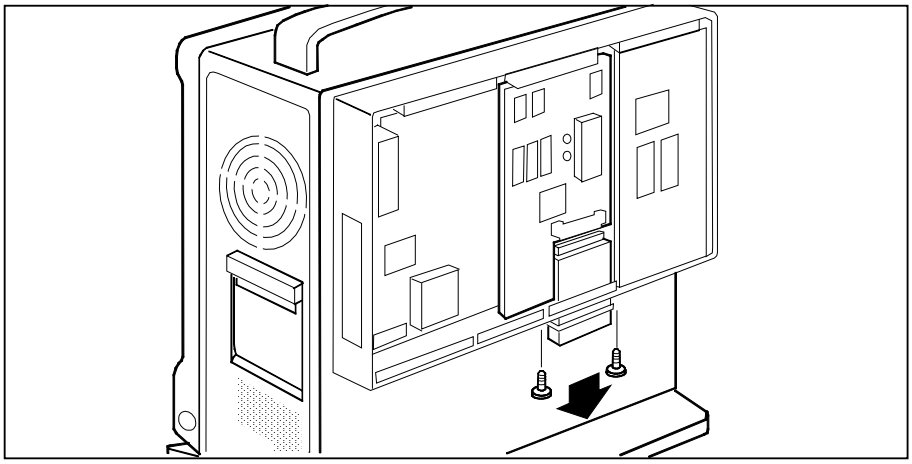
2. Unscrew the six screws holding the back plate in position and remove the plate.



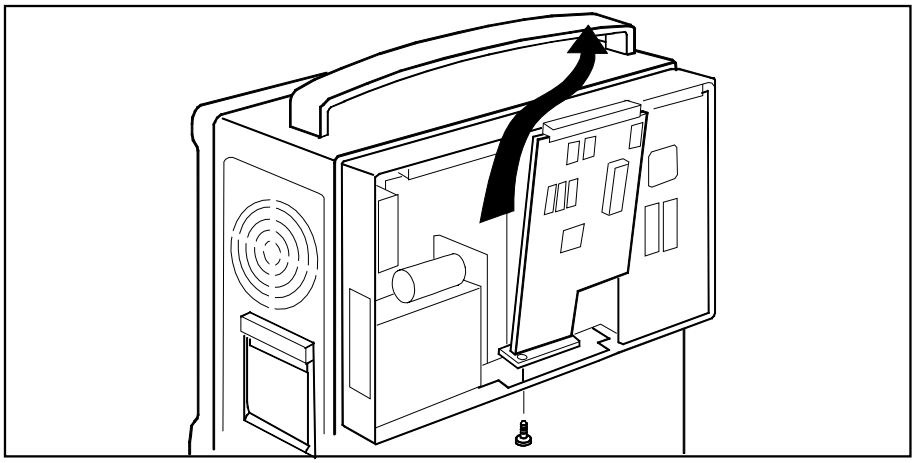
**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Remove the software cartridge.



4. Unscrew the screw holding the CPU Board in position and remove the board.



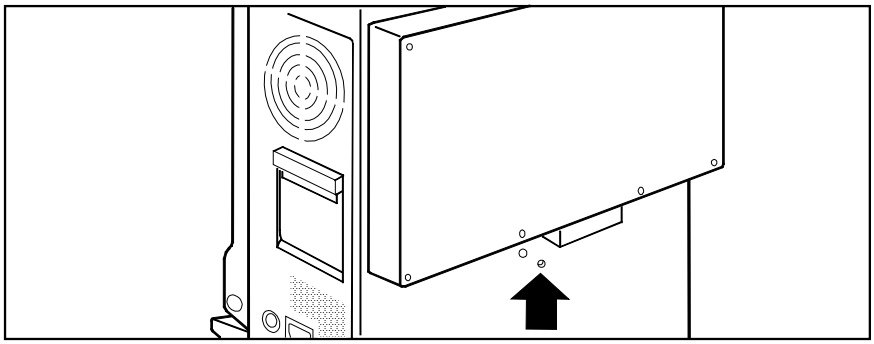
5. Remove the CPU Board from the protective anti static packaging. Always hold the board by the edges and wear a wrist grounding strap.

CAUTION The CPU Board comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

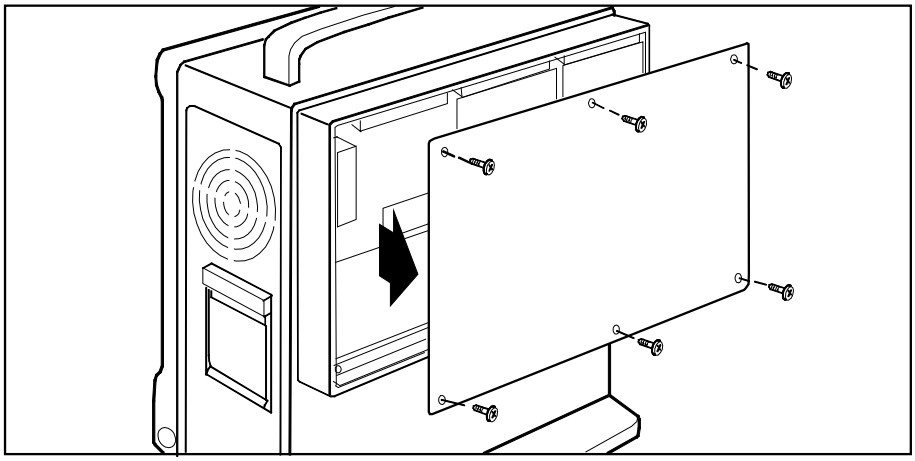
6. Remove the EMC plate from the CPU Board.
7. Insert the new CPU Board into the empty slot and firmly press the board in position. Secure the new board.
8. Replace the Software Cartridge and secure the cartridge with the two screws removed from the cartridge earlier.
9. Replace the back plate and secure the plate with the six screws removed from the plate earlier.
10. Reconnect the Power Cord.
11. Perform Factory Reset.

## 3.4 AS/3 Memory Board, B-CMMEM Installation (w/ B-CPU2/3)

1. Make sure that the power is turned off on the Compact Monitor and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



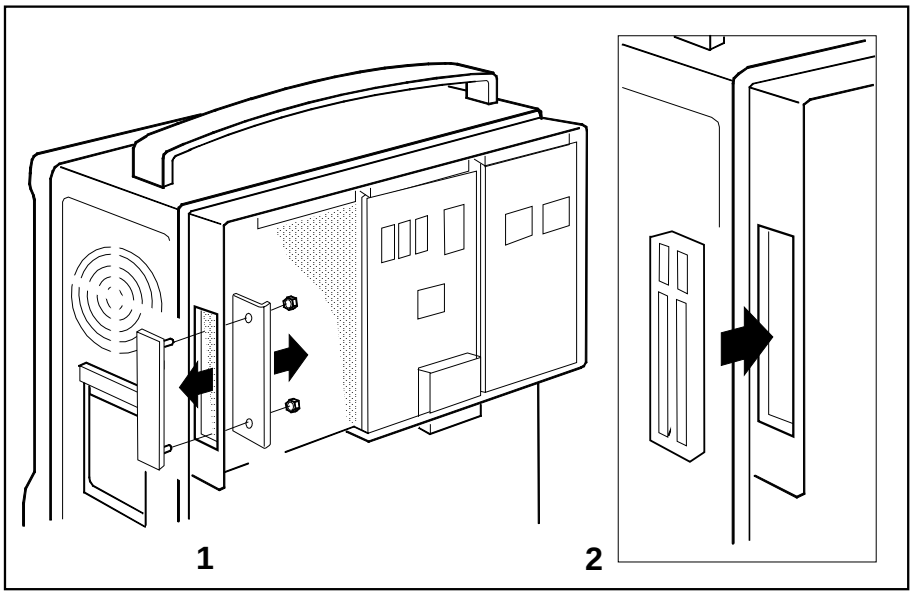
2. Unscrew the six screws holding the back plate in position and remove the plate.



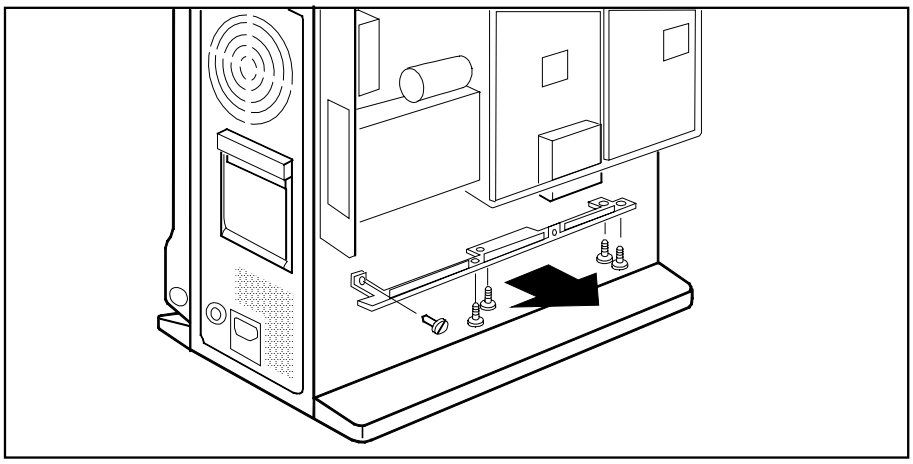
**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Unscrew the two nuts holding the side plates in position and remove the plates. Put the memory card collar in the place of the side plates.



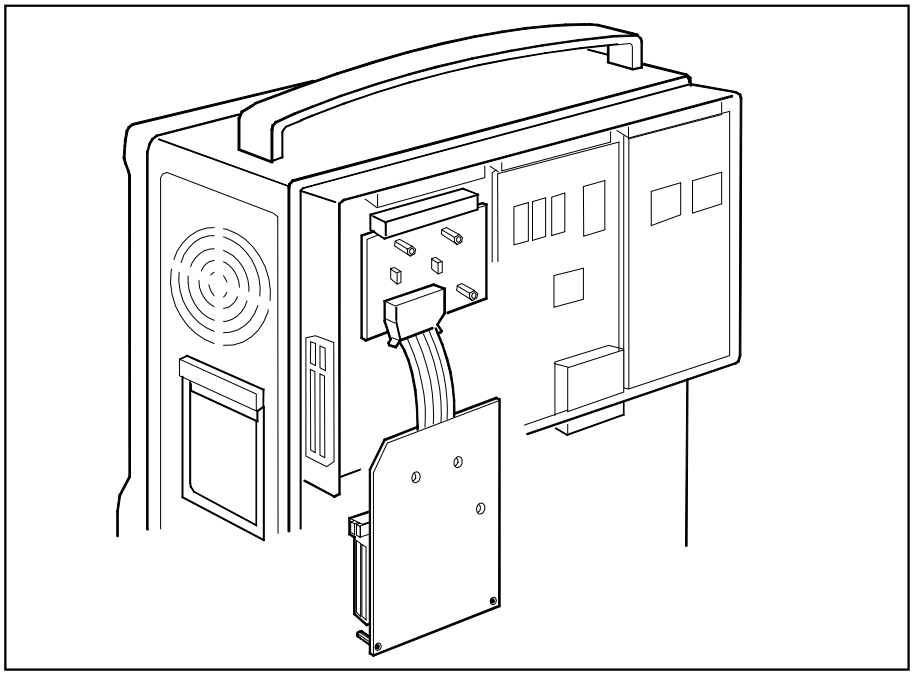

4. Unscrew the five screws holding the bottom plate in position and remove the plate.



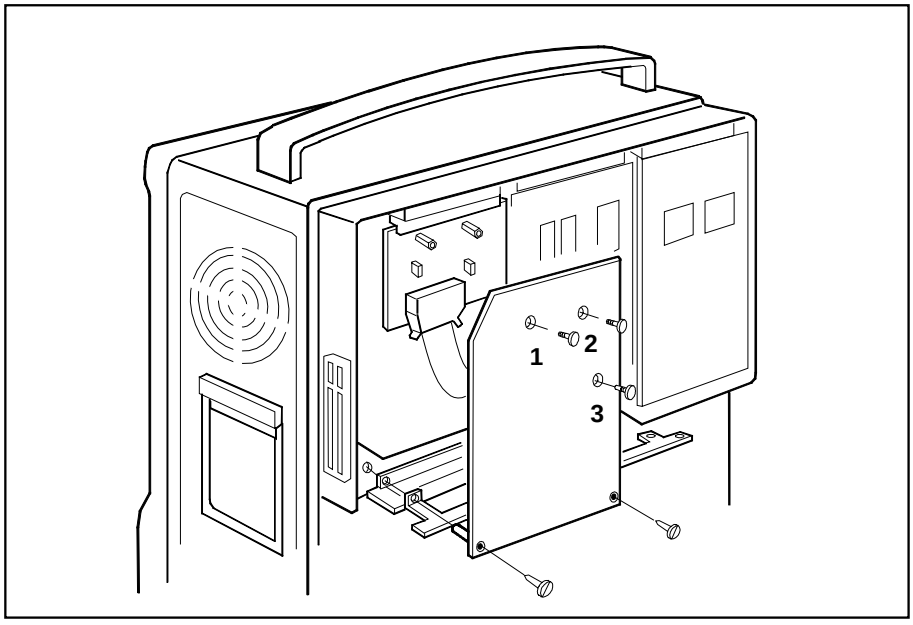
5. Unscrew the screw holding the cover plate in position and remove the plate.
6. Remove the Memory Board, B-CMMEM, including the connection board and the memory board, from the protective anti static packaging. Always hold the boards by the edges and wear a wrist grounding strap.

CAUTION The Memory Board, B-CMMEM comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

7. Insert the connection board into the empty slot and firmly press the board in position.



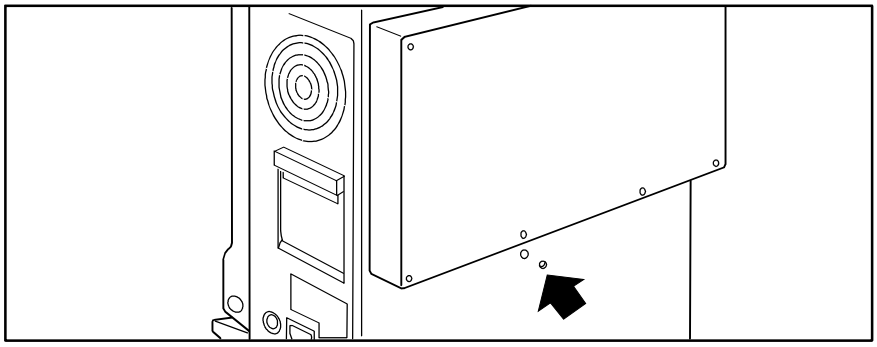
8. Place the memory board, the bottom plate and the cover plate in position. First, secure the memory board with the three screws in the sequence indicated. Then, secure the memory board, the bottom plate and the cover plate with the two screws (M3x25). Finally, secure the bottom plate (four screws).



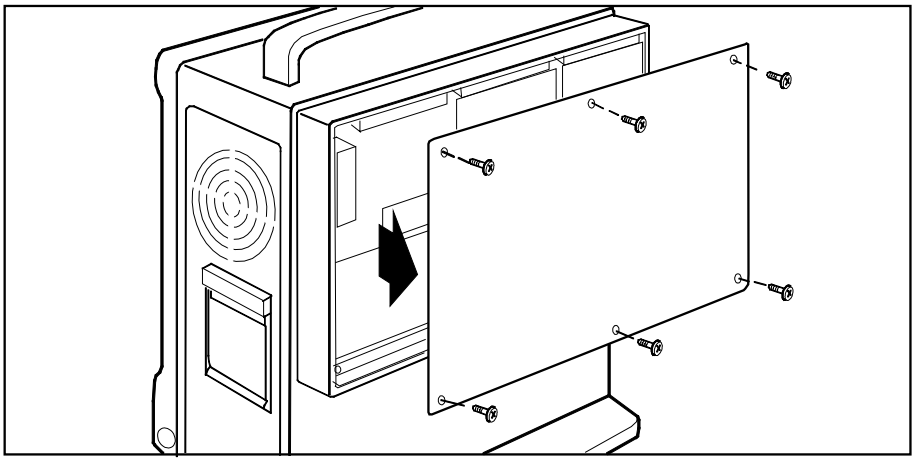

9. Replace the back plate (six screws).
10. Reconnect the power cord.

## 3.5 AS/3 Memory Board, B-CMMEM Installation (w/ B-CMCPU4)

1. Make sure that the power is turned off on the Compact Monitor and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



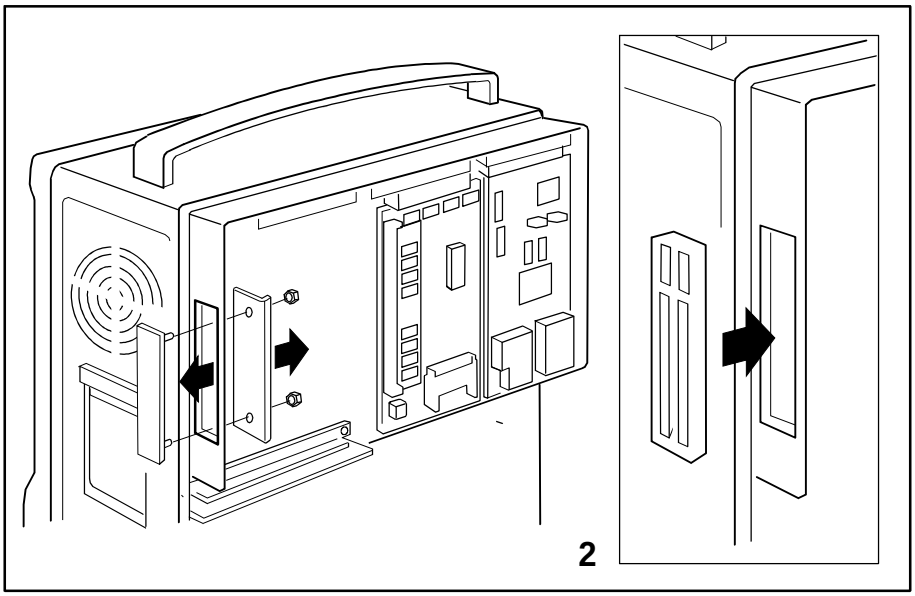
2. Unscrew the six screws holding the back plate in position and remove the plate.



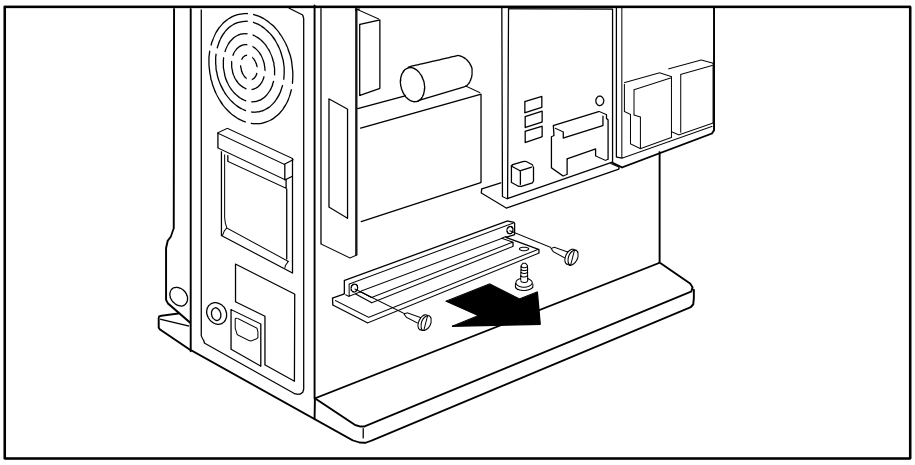
**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Unscrew the two nuts holding the side plates in position and remove the plates. Put the memory card collar in the place of the side plates.



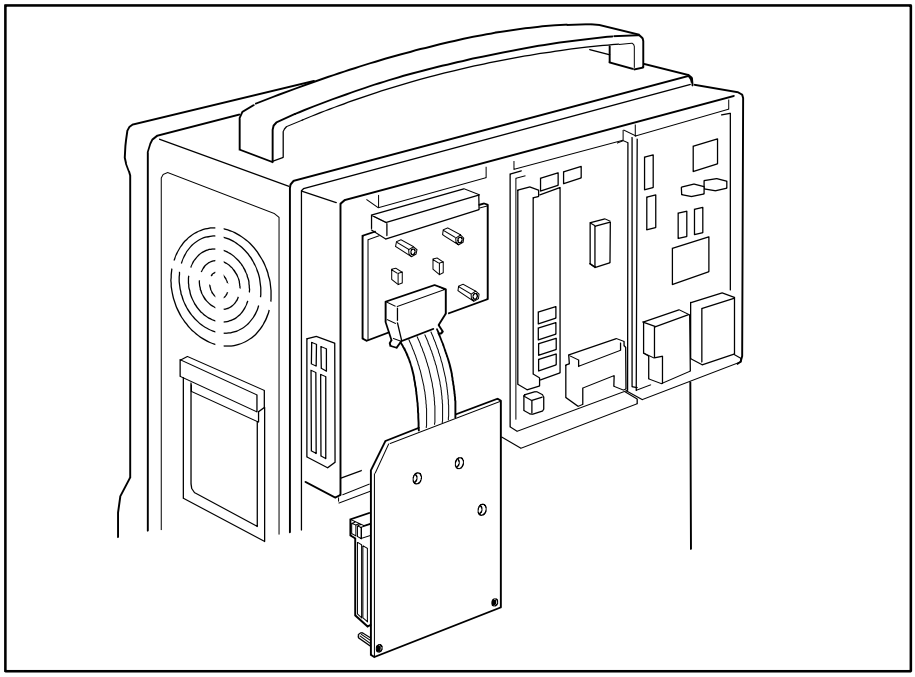

4. Unscrew the screws holding the bottom plate in position and remove the plate.



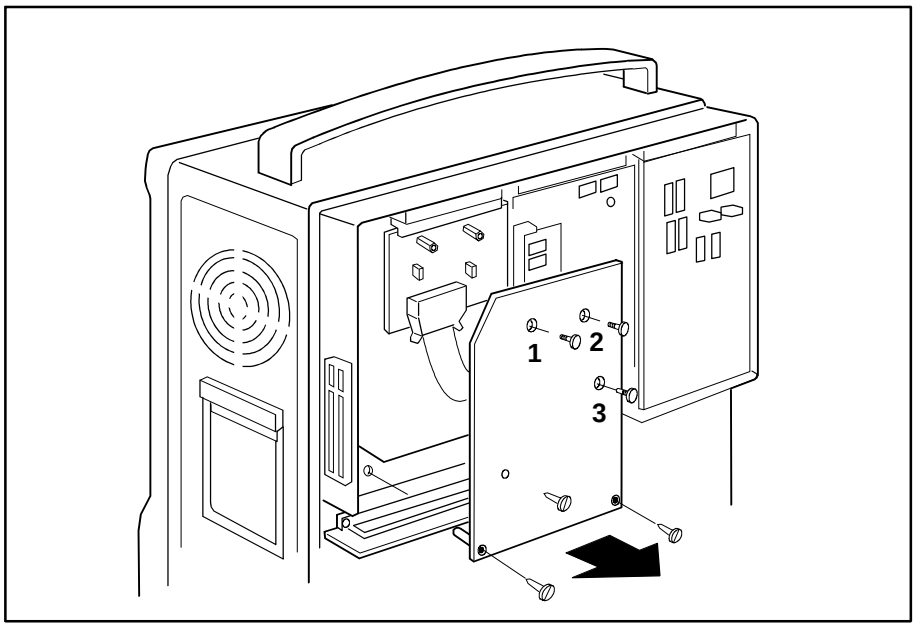
5. Remove the Memory Board, B-CMMEM, including the connection board and the memory board, from the protective anti static packaging. Always hold the boards by the edges and wear a wrist grounding strap.

CAUTION The Memory Board, B-CMMEM comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

6. Insert the connection board into the empty slot and firmly press the board in position.



7. Place the memory board, the bottom plate and the cover plate in position. First, secure the memory board with the three screws in the sequence indicated. Then, secure the memory board, the bottom plate and the cover plate with the two screws (M3x25). Finally, secure the bottom plate (four screws).

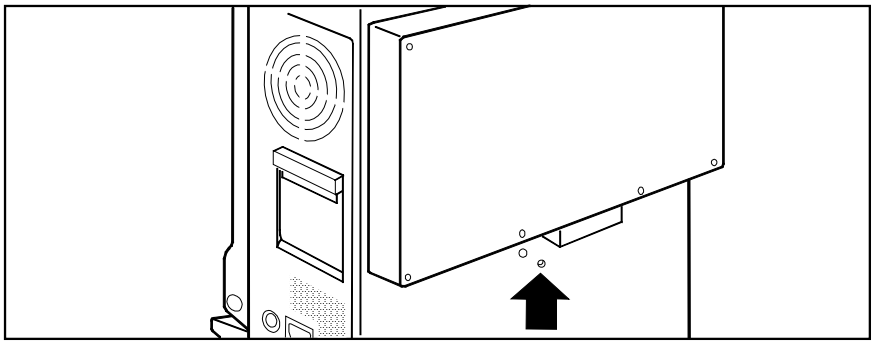



8. Replace the back plate (six screws).
9. Reconnect the power cord.

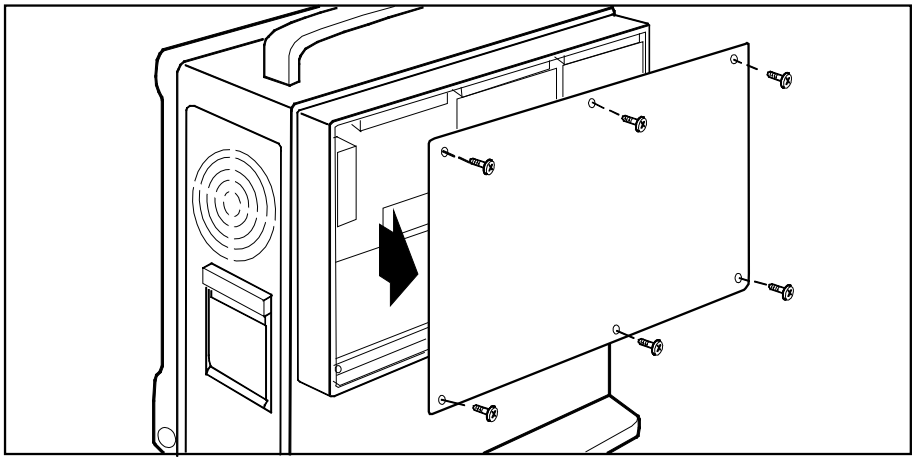
## 3.6 Network Board, B-NET Installation (w/ B-CPU2/3)

Insert the Network Board, B-NET according to following procedure.

1. Make sure that the power is turned off on the Compact Monitor is and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



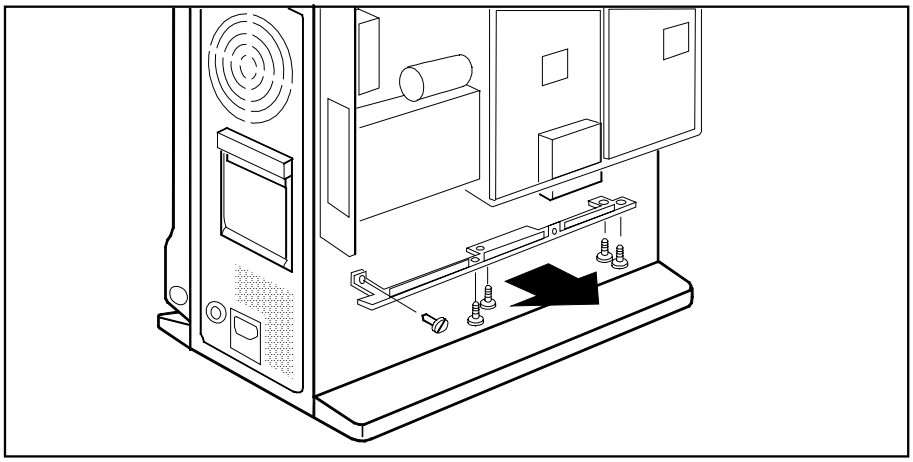
2. Unscrew the six screws holding the back plate in position and remove the plate.



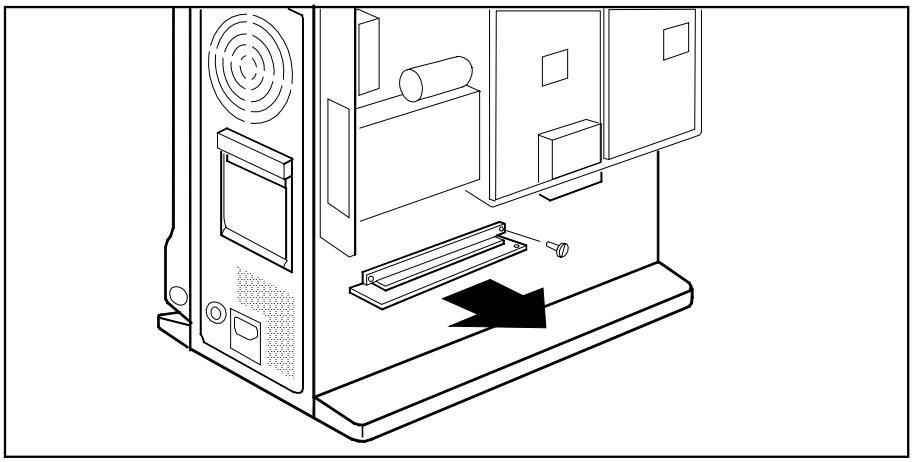
**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Unscrew the five screws holding the bottom plate in position and remove the plate.



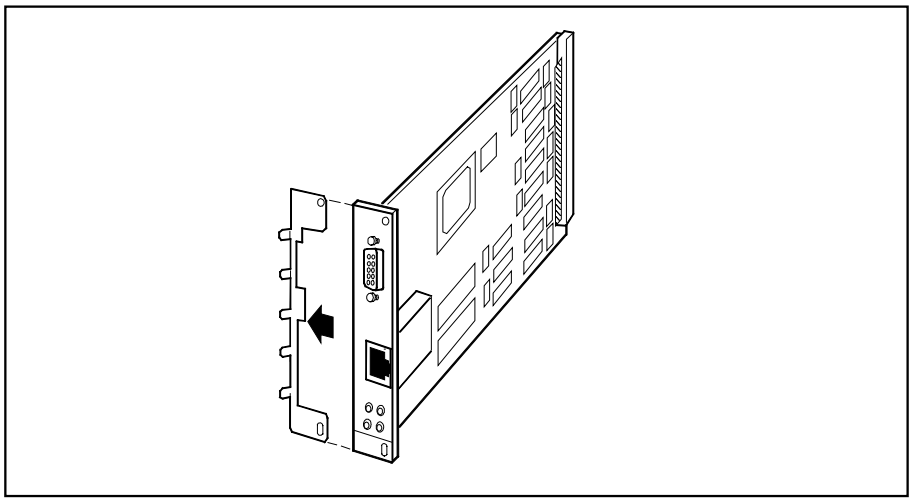
4. Unscrew the screw holding the cover plate in position and remove the plate.



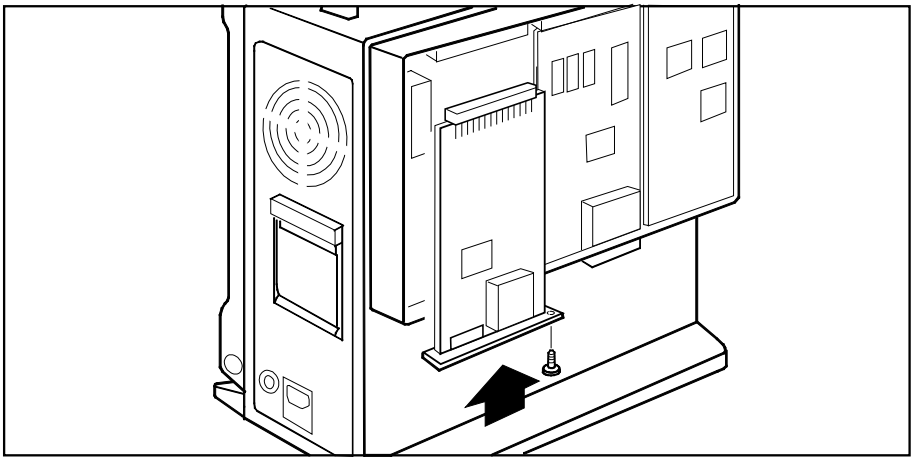
5. Remove the Network Board, B-NET from the protective anti static packaging. Always hold the board by the edges and wear a wrist grounding strap.

CAUTION The Network Board, B-NET comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

6. Loosen the two screws holding the EMC plate in position, remove the plate and tighten the screws.



7. Insert the Network Board, B-NET into the empty slot and firmly press the board in position. Secure the board with the screw removed from the cover plate earlier.

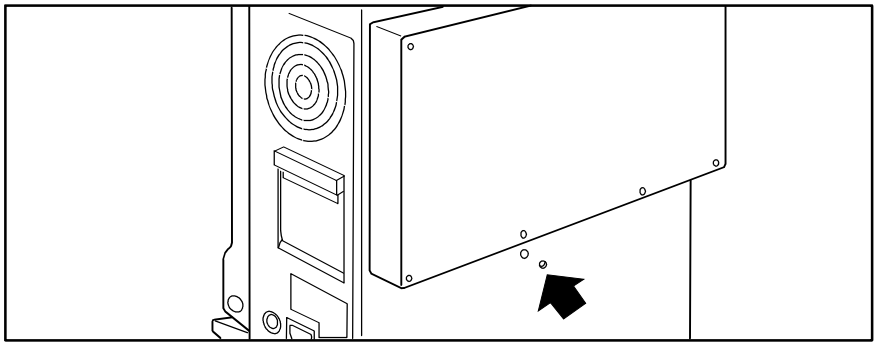


8. Replace the bottom plate and secure the plate with the five screws removed from the plate earlier.
9. Replace the back plate and secure the plate with the six screws removed from the plate earlier.
10. Reconnect the Power Cord.

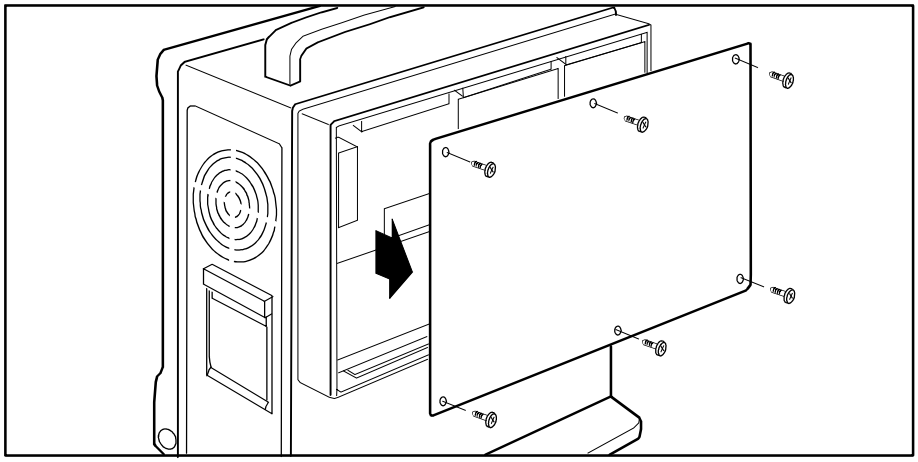
## 3.7 Network Board, B-CMNET Installation (w/ B-CMCPU4)

Insert the Network Board, B-CMNET (B-CMNET differs from B-NET with mechanical changes) according to following procedure.

1. Make sure that the power is turned off on the Compact Monitor is and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



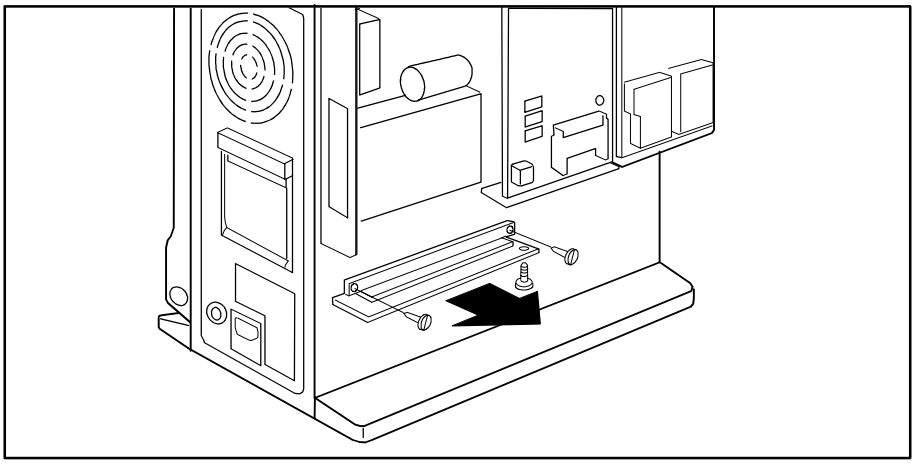
2. Unscrew the six screws holding the back plate in position and remove the plate.



**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

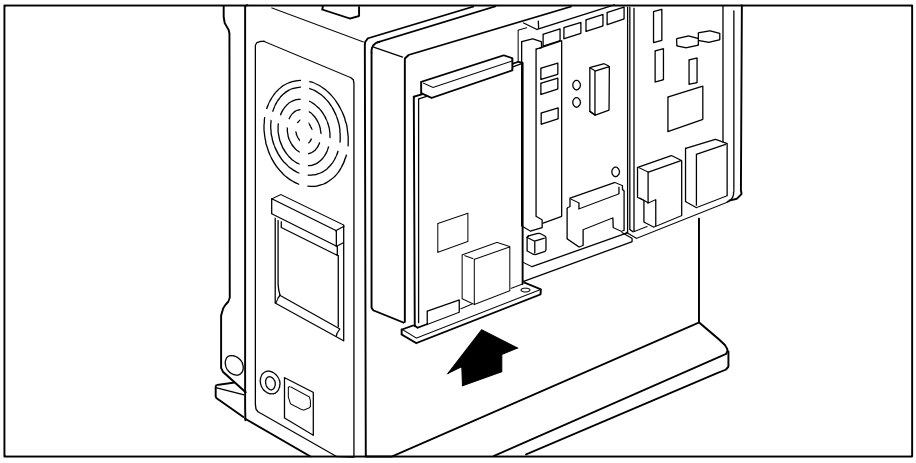
3. Unscrew the screws holding the bottom plate in position and remove the plate.



4. Remove the Network Board, B-CMNET from the protective anti static packaging. Always hold the board by the edges and wear a wrist grounding strap.

CAUTION The Network Board, B-CMNET comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

5. Insert the Network Board, B-CMNET into the empty slot and firmly press the board in position. Secure the board with the screw removed from the cover plate earlier.

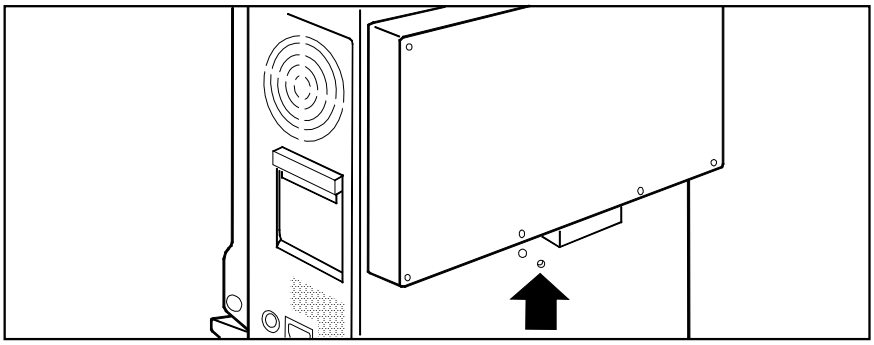


6. Replace the back plate and secure the plate with the six screws removed from the plate earlier.
7. Reconnect the Power Cord

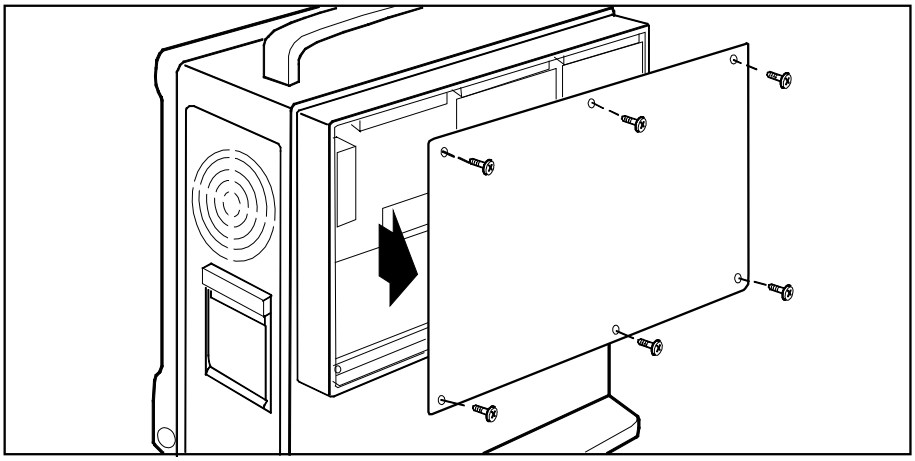
## 3.8 AS/3 UPINET Board, B-UPINET Installation (w/ B-CPU2/3)

Insert the B-UPINET Board according to following procedure.

1. Make sure that the power is turned off on the Compact Monitor and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



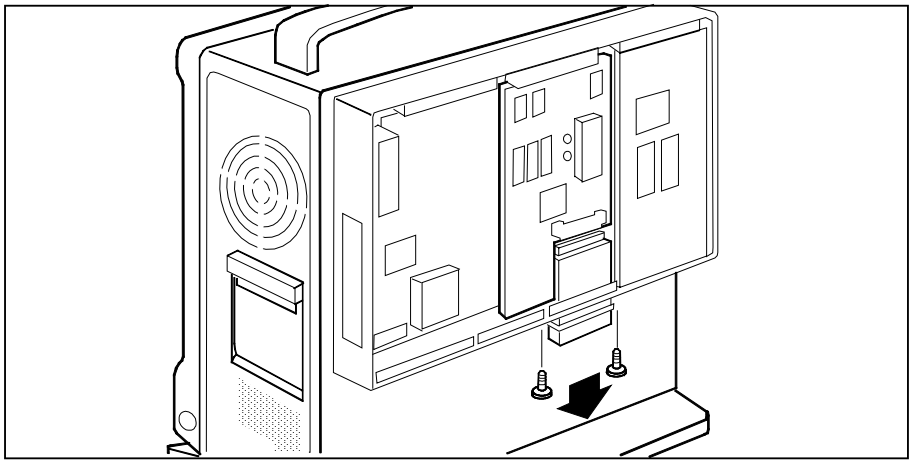
2. Unscrew the six screws holding the back plate in position and remove the plate.



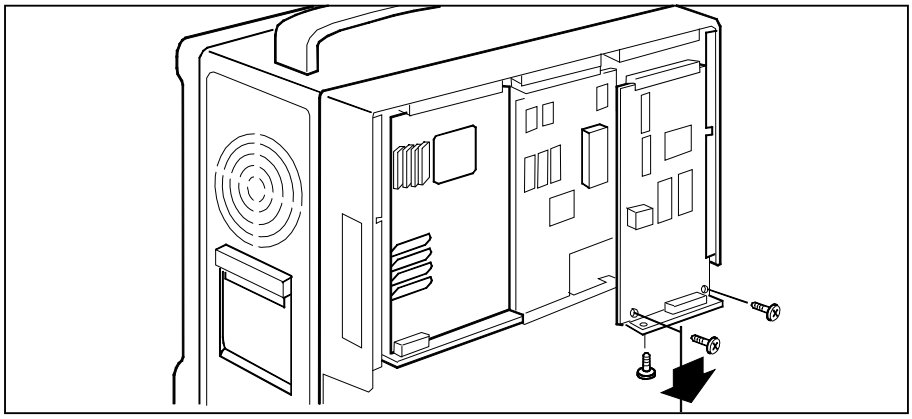
**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

3. Unscrew the two screws holding the software cartridge in position and remove the cartridge.

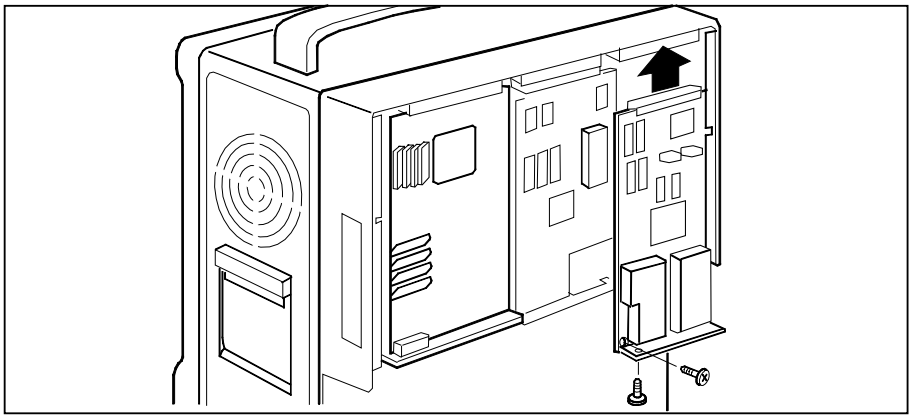


4. Unscrew the three screws holding the UPI Board in position and remove the board.



5. Remove the UPINET Board, B-UPINET from the protective antistatic packaging. Always hold the board by the edges and wear a wrist grounding strap.

The UPINET Board, B-UPINET comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.



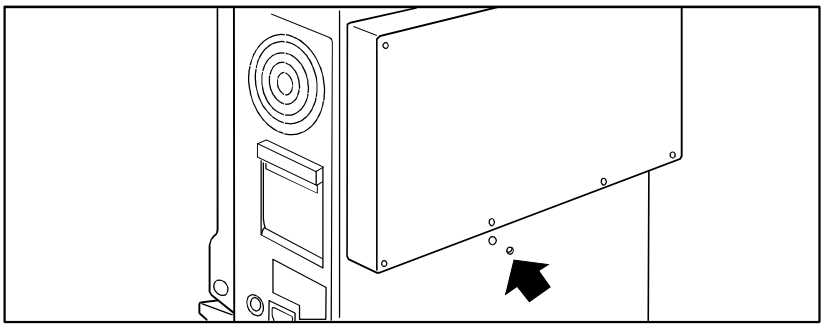
6. Insert the UPINET Board, B-UPINET into the empty slot and firmly press the board in position. Secure the board with the two screws removed from the UPI Board earlier.
7. Attach the EMC gasket to the EMC cases on the UPINET Board so that the adhesive part of the gasket is against the cases. Place the right end of the gasket next to the back plate screw hole in the lower right corner of the frame. Fit the gasket closely to the front plate.
8. Replace the Software Cartridge and secure the cartridge with the two screws removed from the cartridge earlier.
9. Replace the back plate and secure the plate with the six screws removed from the plate earlier.
10. Connect the B-NET connector cable to the network connector.
11. Reconnect the Power Cord.

**NOTE:** These instructions applies only for F-CM(REC) rev. 02 and rev. 03 and for F-CMC(REC) rev. 00 Compact Monitors. For earlier revisions also additional parts are required. Please contact your authorized Datex-Ohmeda distributor.

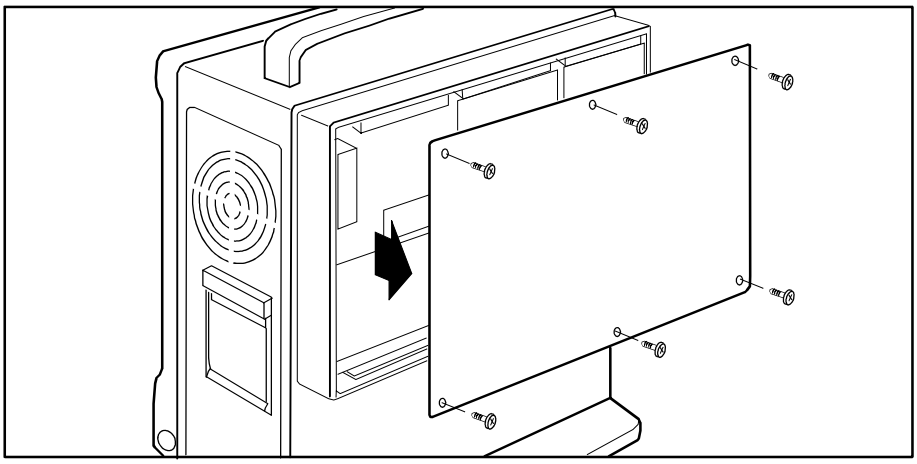
## 3.9 AS/3 UPINET Board, B-UPINET Installation (w/ B-CMCPU4)

Insert the B-UPINET Board according to following procedure.

1. Make sure that the power is turned off on the Compact Monitor and unplug the Power Cord. Press and hold the Service Reset button on the rear panel for at least five seconds until the service reset indicator LED is switched off.



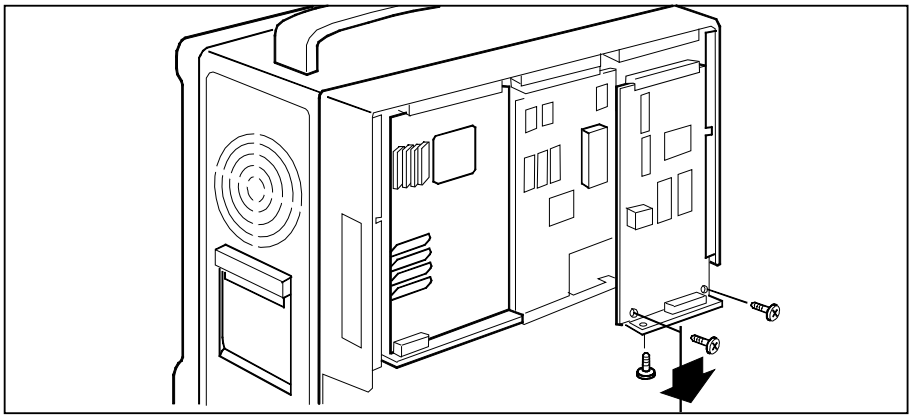
2. Unscrew the six screws holding the back plate in position and remove the plate.



**WARNING** **The Compact Monitor is always energized by the internal battery. Do not touch any exposured wiring or conductive surface with metallic object while the back plate is off or electric failure may result.**

CAUTION The Compact Monitor is always energized by the internal battery. A short circuit may cause internal damage.

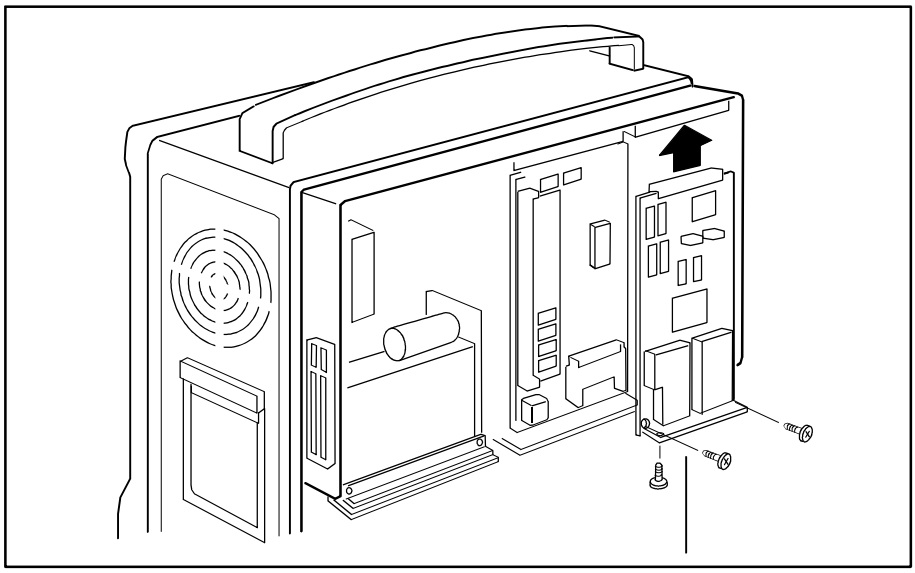
3. Unscrew the three screws holding the UPI Board in position and remove the board.



4. Remove the UPINET Board, B-UPINET from the protective antistatic packaging. Always hold the board by the edges and wear a wrist grounding strap.

CAUTION The UPINET Board, B-UPINET comprises sensitive integrated circuits that can be damaged by an electrostatic discharge. Careful handling of the board is therefore essential.

5. Insert the UPINET Board, B-UPINET into the empty slot and firmly press the board in position. Secure the board with the two screws removed from the UPI Board earlier.



6. Replace the back plate and secure the plate with the six screws removed from the plate earlier.
7. Connect the B-NET connector cable to the network connector.
8. Reconnect the Power Cord.

**NOTE:** These instructions applies only for F-CM(REC) rev. 04 and F-CMC(REC) rev. 01 Compact Monitors. For earlier revisions also additional parts are required. Please contact your authorized Datex-Ohmeda distributor.

## 3.10 Compact Airway Modules, M-XXXX

Airway modules of M-family (M-C etc.) are installed as any plug-in modules.

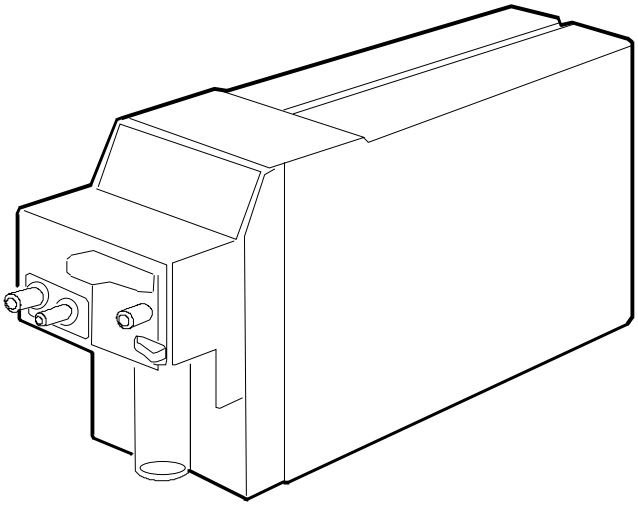


**Figure 10- Datex-Ohmeda Compact Airway Module**

### 3.10.1 Sample Gas Exhaust

When $N_2O$ or volatile anesthetics are used, pollution of the operation room by these gases should be prevented. Connect the sample gas outlet of the module to the scavenging system or return it to the patient circle.

Connect the sample gas outlet of the module to the scavenging system either

– through the ventilator reservoir.

– directly to the scavenging tube using a T-fitting.

Connect sample gas outlet only to open scavenging system where gas is removed in room pressure.

CAUTION Strong scavenging suction may change the operating pressure of the module and cause inaccurate readings or internal damage.

### 3.10.2 Scavenging Through Reservoir

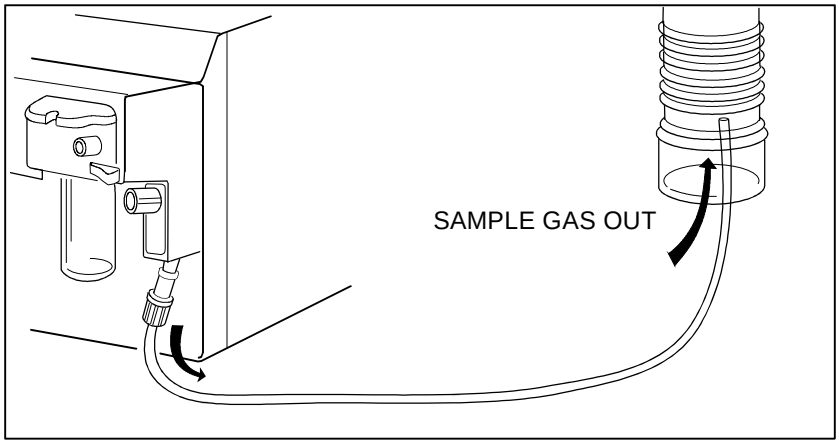



**Figure 11 Scavenging through Ventilator Reservoir**

- Connect an exhaust line to the sample gas outlet on the module's front panel.
- Attach the other end of the line to the ventilator reservoir. Make sure that the reservoir tube diameter is at least 2-3 times larger than the exhaust line.

### 3.10.3 Scavenging Through Direct Connection

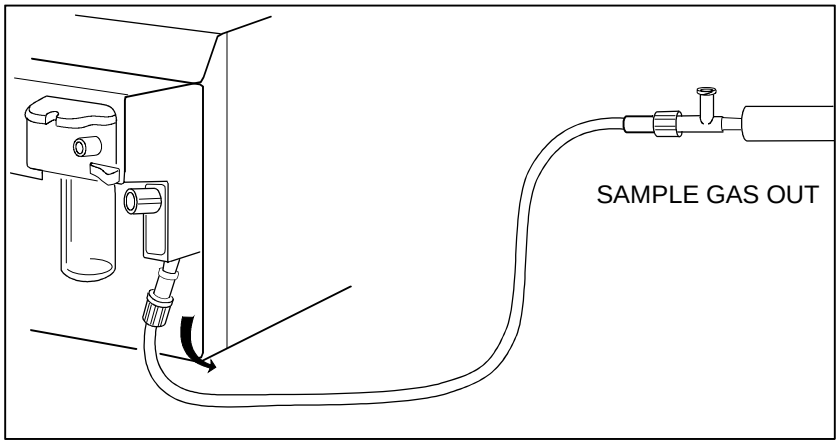



**Figure 12 Connection Directly to a Scavenging System**

- Connect a T-fitting between the monitor and the exhaust line.
- Attach the other end of the line to the scavenging tube.

### 3.10.4 Returning Gas to Patient Circuit

The sampling gas can also be returned to the patient circuit. If you use the Datex-OhmedaAS/3 Anesthesia Delivery Unit (ADU), you need an optional adapter connected to the patient breathing tubes.

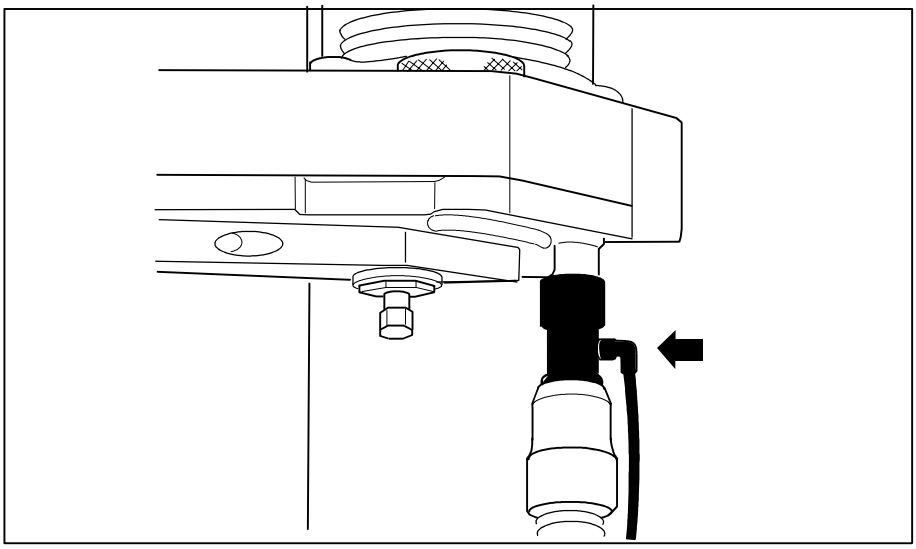


**Figure 13 Sample Gas Return to Patient Circuit in ADU**

## 3.11 AS/3 Anesthesia Keyboard, K-ARK

To connect AS/3 Anesthesia Keyboard, K-ARK to the Compact Monitor:

1. Make sure that the power is turned off on the Compact Monitor.
2. Connect the Keyboard-LCD Display Cable to the K-ARK connector on the display and to the connector on the rear of the keyboard. Secure the connection with the thumb screw and slip the cable beneath the fasteners.

## 3.12 Remote Controller, K-REMCO

To connect a Remote Controller, K-REMCO to your Compact Monitor you need a Remote Controller-Compact Monitor Cable. For further information, please contact your authorized Datex-Ohmeda distributor.

# 3.13 Bar Code Reader

## 3.13.1 Connection to the Compact Monitor

The bar code reader can be connected to the K-ARK connector on the monitor.

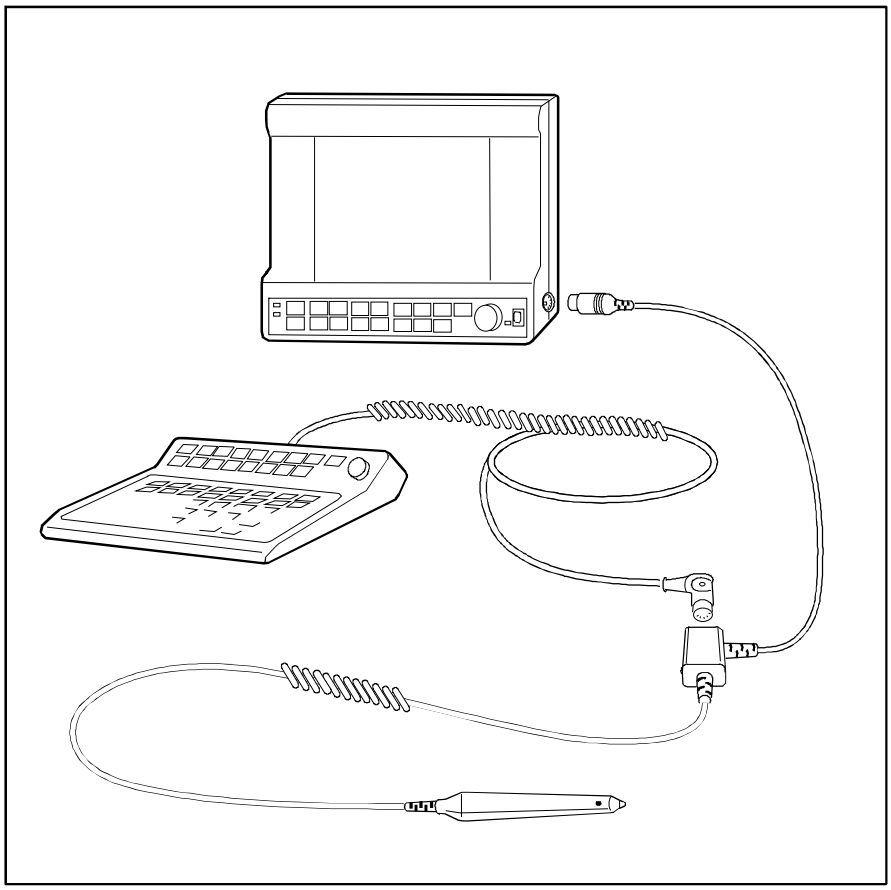


**Figure 14 Bar Code Reader connected to the Compact Monitor**

## 3.13.2 Different Configurations

The bar code reader comes from HP factory with factory default settings. These settings are slightly modified at Datex-Ohmeda factory to match Datex-Ohmeda applications. The following table shows the differences between the HP configuration and the Datex-Ohmeda configuration.

| Option | HP configuration | Datex-Ohmeda configuration |
|---|---|---|
| Message components | | |
| Header | [<<61>>] | [hhh] |
| No-read | [<<61>><<61>>] | [] |
| Keycodes | | |
| Key delay | [1] ms | [12] ms |

The default settings can also be modified outside the factory by scanning special bar code labels from the documentation that comes with the scanner. To do this the scanner should be connected to the keyboard port of your PC.

1. Start the configuration (Default Wedge Mode).
2. Begin with the header label (Header). Set the contents of the header to hhh.
3. End the header (End of Characters).
4. Clear the no-read message (No-Read Message is Empty).
5. Select the interkey delay (Interkey Delay). Set the interkey delay to 12 s.

The configuration of the bar code reader is shown by scanning the Show Configuration label.

## CONFIGURATION DISPLAY

```
 --- Version 14.3 ------------------------- (c) Hewlett-Packard 1986-1992
|  CODE  |READ |CHECK CHAR | LENGTH | CODE ID  |  OTHER CONFIG. SETTINGS  |
|________|_____|verif_xmit_|min__max|xmit:[off]|--------------------------|
|Code 39 |[yes]|[no] | yes |[1] [32]|   [a]    |Extended: [no]            |
|Int. 2/5|[yes]|[no] | yes |[4] [32]|   [b]    |Length: [variable]        |
|Codabar |[yes]|[no] | yes |[1] [32]|   [d]    |Include start/stop: [yes] |
|Code 128|[yes]| yes | no  |[1] [32]|   [e]    |                          |
|Code 11 |[yes]| [1] | yes |[2] [32]|   [f]    |                          |
|MSI Code|[yes]| yes | yes |[3] [32]|   [g]    |                          |
|Code 93 |[yes]| yes | no  |[1] [32]|   [h]    |                          |
|UPC/EAN |[yes]| yes |[yes]| fixed  |   [c]    |[+ none]                  |
|  E:[0] |     |     |     |        |          |EAN:[yes]   ID chars:[off]|
|----------- MESSAGE COMPONENTS ----------------------------------------|
|      Ctrl character = ^ + letter       ®nn¯ = Extended Key index       |
|Header:[hhh]                                                            |
|Trailer:[^M]                                                            |
|No-Read:[]                                                              |
|--- KEYCODES --------- OPERATOR FEEDBACK ----------- GENERAL ------------|
|Key Delay:[10] ms |Ready Signal:[on]          |[Wedge] (using keyboard)  |
|[U.S. English]    |Menu Scan Responses:[on]   |No-Read Recognition:[off] |
|Code Set:[auto]->2|Good Read LED:[flashes]    |Family:[auto]->PC/AT,PS/2 |
|ALT Sequence:[off]|LED Active:[high]          |Ctrl Chars:[ASCII]        |
 ------------------------------------------------------------------------
```

## 3.14 Troubleshooting

If a problem occurs during the functional examination, check the components of the monitor according to the following troubleshooting chart. If the problem persists, please refer to the part II.

| TROUBLE | TREATMENT |
|---|---|
| Nothing functions | Unplug and replug Remote Controller Cable. Also confirm that the cable is intact.<br>Unplug and replug the Power Cord. Also confirm that the cable is intact.<br>Confirm that the fuses are intact. |
| A plug-in module does not function | Remove and replace the module.<br>Confirm that the desired parameters are configured to be displayed. |
| The airway module does not function | Confirm that “Occlusion” or “Calibrating Gas Sensor” messages are not displayed.<br>Confirm that a D-fend water trap and a sample tube are attached.<br>Confirm that the desired parameters are configured to be displayed.<br>Remove and replace the module. |

# 4 INTERFACING

You can interface external devices to the AS/3 and CS/3 monitor via B-UPI or B-UPINET Board and Interface Module (M-INT). For interfacing an intra-aortic balloon pump, ECG and pressure signals are available from the M-PT module.

Via B-UPI or B-UPINET board you can interface:

- Datex-Ohmeda monitors
- AS/3 Anesthesia Delivery Unit
- printers

Via M-INT you can interface:

- Datex-Ohmeda monitors
- some monitors of other manufacturers
- some anesthesia machines

# 4.1 Interfacing Monitors via UPI Board, B-UPI

The parameters transferred to the Compact Monitor are summarized in table 4-1.

## 4.1.1 Interconnection Datex-Ohmeda Monitors

Use the UPI-Monitor Cable to connect Compact Monitor to Datex-Ohmeda monitors.

1. Make sure that the power to both devices is turned off.
2. Connect the 9 pin D-shaped connector to the X3 connector and the 44 pin D-shaped connector to the X2 connector on the UPI Board. Tighten the finger screws.
3. Connect the 25 pin D-shaped connector to the corresponding connector on the rear of the other monitor. Tighten the finger screws.

**Table 1 Transference of Parameters, Datex-Ohmeda Monitors**

| Device | Waveforms (analog) | Numerics | Alarms |
|---|---|---|---|
| Cardiocap | $CO_2$ | Et&Fi Airway gases, Respiration rate, $SpO_2$, Pulse rate | None |
| Capnomac<br>Capnomac II | $CO_2$ | Et&Fi Airway gases, Respiration rate. | None |
| Capnomac Ultima | $CO_2$, Pleth | Et&Fi Airway gases, Respiration rate, Spirometry, $Sp_{02}$, Pulse rate, Pleth amplitude | $CO_2$, $O_2$, Anesthesia agent, respiration rate, Apnea, occlusion, $SpO_2$, pulse rate. |
| Normocap 200<br>Normocap 200 OXY | $CO_2$ | Et&Fi Airway gases, Respiration rate. | None |
| Oscar<br>Oscar II<br>Oscar OXY | $CO_2$, Pleth | Et&Fi Airway gases, Respiration rate, $SpO_2$, Pulse rate, Pleth amplitude | None |
| Satlite<br>Satlite II<br>Satlite Plus | Pleth | $SpO_2$, Pulse rate, Pleth amplitude | None |
| Satlite Trans | None | $SpO_{2,}$, Pulse rate, Pleth amplitude | None |

### 4.1.2 Setting the Interfacing Parameters

Set the serial output mode of Datex-Ohmeda monitors: Capnomac Ultima, Satlite Trans and Normocap to numeric. This setting can be stored into permanent memory through the startup menu. See the monitors' manual for further information.

### 4.1.3 Setting the Interfacing Parameters for the Compact Monitor

1. Press the **Monitor Setup** key.
2. Select ***Install/Service*** password (16-4-34).
3. Select ***Interfacing*** and combine a required parameter with an external monitor. Two letters, al, denote alarm integration. The selection will be automatically stored in permanent memory.
4. Press the **Normal Screen** key.

## 4.2 Interfacing with Datex-Ohmeda Monitors via UPINET Board, B-UPINET

It is possible to interface Datex-Ohmeda monitors to the Compact Monitor via the UPINET Board, B-UPINET. The parameters transferred to the Compact Monitor are summarized in table 4-1.

NOTE: Because the analog inputs are missing, waveforms are not transferred to the Compact Monitor if the UPINET Board, B-UPINET is used.

### Interconnection

Use the B-INT-External Device Cable to connect the Compact Monitor to Datex- Ohmeda monitors.

1. Make sure that the power is turned off on both devices.
2. Connect the 9 pin D-shaped connector to the corresponding connector on the UPINET Board, B-UPINET.
3. Connect the remaining 25 pin D-shaped connector to the corresponding connector on the rear of the other monitor. Tighten the finger screws.

### Setting the Interfacing Parameters for Datex-Ohmeda Monitors

Set the interfacing parameters for the Datex-Ohmeda monitors according to previously described procedure.

### Setting the Interfacing Parameters for Compact Monitor

Set the interfacing parameters for the Compact Monitor according to previously described procedure.

## 4.3 Interfacing Monitors via M-INT

It is possible to interface Datex-Ohmeda monitors, Critikon Dinamap 1846SX, Abbott Oximetrix 3, Baxter Explorer and Vigilance, Nellcor N-100, N-200 and N-1000 to the Compact Monitor via the Interface Module, M-INT. Interface Module, M-INT, has two serial and analog connectors (X7 and X8). The parameters transferred are summarized in tables 4-1 and 4-2.

**NOTE:** Using the Interface Module , M-INT disables interfacing with Datex-Ohmeda monitors via the UPI/UPINET Board.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

**Table 2 Transference of Parameters, Other Monitors**

| Device | Waveforms | Numerics | Alarms |
|---|---|---|---|
| Critikon<br>Dinamap 1846SX | None | NIBP | None |
| Abbott<br>Oximetrix 3 | None | SvO2/SaO2, CO | None |
| Baxter<br>Explorer | None | C.O., SvO2, REF, Tblood | None |
| Baxter<br>Vigilance | None | C.O., SvO2, C.C.O.,<br>Tblood | None |
| Nellcor<br>N-100<br>N-200<br>N-1000 | Pleth (analog) | SpO2, Pulse rate | None |

### 4.3.1 Connection to Datex-Ohmeda Monitors

Use the INT-External Device Cable.

1. Make sure that the power to both devices is turned off.
2. Connect the 9 pin D-shaped connector to one of the connectors on the Interface Module, M-INT. Tighten the finger screws.
3. Connect the 25 pin D-shaped connector to the corresponding connector on the other monitor. Tighten the finger screws.

### 4.3.2 Connection to Critikon Dinamap 1846SX, Abbott Oximetrix 3 and Baxter Explorer

Use the INT-External Device Cable.

1. Make sure that the power to both devices is turned off.
2. Connect the 9 pin D-shaped connector to one of the connectors on the Interface Module, M-INT. Tighten the finger screws.
3. Connect the remaining 25 pin D-shaped connector to the connector on the other monitor. Tighten the finger screws.

### 4.3.3 Connection to Baxter Vigilance

Use the INT-Baxter Vigilance Cable.

1. Make sure that the power to both devices is turned off.
2. Connect one of the connectors to the corresponding connector on the Interface Module, M-INT. Tighten the finger screws.
3. Connect the other 9 pin D-shaped connector to the on the other monitor. Tighten the finger screws.

### 4.3.4 Connection to Nellcor N-100 and N-1000

Use the Monitor-Nellcor Cable.

1. Make sure that the power to both devices is turned off.
2. Connect the 9 pin D-shaped connector to on of the connectors on the Interface Module, M-INT. Tighten the finger screws.
3. Connect the mono connectors to the corresponding connectors on the other monitor.

### 4.3.5 Connection to Nellcor N-200

Use the Monitor-Nellcor Cable.

1. Make sure that the power to both devices is turned off.
2. Connect one of the connectors to the corresponding connector on the Interface Module, M-INT. Tighten the finger screws.
3. Connect the other connector to the corresponding connector on the other monitor. Tighten the finger screws.
4. Connect the mono connectors to the corresponding connectors on the other monitor.

## 4.4 Interfacing Datex-OhmedaAS/3 Anesthesia Delivery Unit

It is possible to interface Datex-Ohmeda Anesthesia Delivery Unit to the Compact Monitor via the UPI Board.

For further information, please contact your authorized Datex-Ohmeda distributor.

## 4.5 Interfacing Dräger Cicero and Cato

It is possible to interface Dräger Cicero and Cato to the Compact Monitor via the Interface Module, M-INT.

For further information, please contact your authorized Datex-Ohmeda distributor.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

## 4.6 Interfacing a printer

It is possible to interface a laser printer (either serial or parallel) to the Compact Monitor via the UPI Board. Only serial printer can also be interfaced via the UPINET board. The printer must be PCL5 compatible.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

**WARNING** **Connecting the power supply cord of the printer to the wall socket may cause the printer leakage current to exceed the limit specified for medical equipment. Always connect the printer to an appropriate separating transformer.**

## 4.7 Interfacing a computer

It is possible to interface a computer to Compact Monitor. For further information, please contact your authorized Datex-Ohmeda distributor.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

**WARNING** **Connecting the power supply cord of the computer to the wall socket may cause the computer leakage current to exceed the limit specified for medical equipment. Always connect the computer to an appropriate separating transformer.**

## 4.8 UPI Board Output Signals

The analog and digital connector X2 on the UPI Board, can be used to interface other devices to the Compact Monitor. Pin assignments are listed in table 4-3.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

### 4.8.1 Digital Outputs

The digital output signals are as follows:

**Defibrillation Sync**

The defibrillation sync signal is generated by the ECG. When activated, the signal is set to a high state and then set back to a low state after 10 ms. The signal is regenerated only after returning to the low state. The high state ranges from 2.8 to 5 V while the low state ranges from 0 to 0.8 V. The delay from the R wave peak to the start of the signal is maximally 35 ms.

**Nurse Call**

The nurse call signal is generated by red, yellow and white alarms. When activated, the signal is set to a high state and remains at a high state until the alarm situation is over or the **Silence Alarm** key is pressed. The high state ranges from 2.8 to 5 V while the low state ranges from 0 to 0.8 V.

**Pacemaker Sync**

The pacemaker sync signal is generated by pacemaker pulses on the ECG. When activated, the signal is set to a high state and then set back to a low state such that the signal pulse width is between 0.5 to 2.5 ms. The high state ranges from 2.8 to 5 V while the low state ranges from 0 to 0.8 V.

**Table 3 Analog and Digital Connector Pin Assignments**

| Pin | Signal |
|---|---|
| 1 | GND |
| 2 | Digital input 3 |
| 3 | Digital output 0, Defibrillation sign |
| 4 | Digital input 2 |
| 5 | Digital output 1, Nurse call |
| 6 | Digital output 3 |
| 7 | Ground |
| 8 | Digital output 2, Pacemaker sign |
| 9 | Analog input, Ch3 |
| 10 | Analog output Ch 5 |
| 11 | Not connected |
| 12 | Not connected |
| 13 | Analog input, Ch 0 |
| 14 | Analog output, Ch 1 |
| 15 | +5 V |
| 16 | Analog output, Ch 4 |

| Pin | Signal |
|---|---|
| 17 | Analog output, Ch 3 |
| 18 | Analog input, Ch 1 |
| 19 | Analog output, Ch 2 |
| 20 | Analog output, Ch 0 |
| 21 | Digital input 4 |
| 22 | Analog input Ch 2 |
| 23 | Digital input 5 |
| 24 | Analog output, Ch 6 |
| 25 | Analog output Ch 7 |
| 26 | Not connected |
| 27 | Not connected |
| 28 | Not connected |
| 29 | Data 0, output |
| 30 | Data 1, output |
| 31 | Data 2, output |
| 32 | Data 3, output |
| 33 | Data 4, output |
| 34 | Data 5, output |
| 35 | Data 6, output |
| 36 | Data 7, output |
| 37 | Not connected |
| 38 | Fast analog ECG |
| 39 | Not connected |
| 40 | Busy, input |
| 41 | Paper End, input |
| 42 | Error, input |
| 43 | Strobe, output |
| 44 | GND |

### 4.8.2 Analog Outputs

The analog output signals are:

Each signal is scaled in linear way between -5 ... +5 volts. The resolution consists of 4096 different voltage levels. All signal levels are updated once in 10 ms.

OFF: Default state. No signal is present at analog output pin.

HR according to selected source (display value): The original scale 0...300 beats are scaled between 0 and 3 volts.

ECGl, ECG2, ECG3: The original scale -5000 microvolts...+5000 microvolts is scaled between -5 and +5 volts.

P1 lre, P2 lre, P3 lre, P4 lre, P5 lre, P6 lre (Invasive pressure real-time values, low resolution): The original scale -20 mmHg...+320 mmHg is scaled between -0.2 and +3.2 volts.

P1 hre, P2 hre, P3 hre, P4 hre, P5 hre, P6 hre (Invasive pressure real-time values, high resolution): The original scale -20 mmHg...+50 mmHg is scaled between -2 and +5 volts.

Pleth: The original scale -100%...100% is scaled between -5 and +5 volts.

$SpO_2$>40, $SpO_2$>60, $SpO_2$>80 (beat-to-beat, display value, 10 s average): The original scale 40-100% ($SpO_2$>40), 60-100% ($SpO_2$>60) or 80-100% ($SpO_2$>80) is scaled between -5 and +5 volts.

$CO_2$: The original scale 0%...10% is scaled between 0 and +5 volts. Values greater than 10% are set to 10%. (Airway gas special indications are applied, see also chapter Special Indications).

AA (Anesthesia Agent): The original scale 0%...10% is scaled between 0 and +5 volts. Values greater than 10% are set to 10%. (Airway gas special indications are applied, see also chapter Special Indications).

$O_2$: The original scale 0%...100% is scaled between 0 and +5 volts. (Airway gas special indications are applied, see also chapter Special Indications).

$N_2O$: The original scale 0%...100% is scaled between 0 and +5 volts. (Airway gas special indications are applied, see also chapter Special Indications).

Paw (Airway Pressure): The original scale -20 cmH2O...+80 cmH2O is scaled between -5 and +5 volts. (Airway gas sensor failure is applied, see also chapter Special Indications).

Flow: The original scale -100 l/min...+100 l/min is scaled between -5 and +5 volts. (Airway gas sensor failure is applied, see also chapter Special Indications).

Volume: The original scale -2.5 litters...+2.5 litters is scaled between -5 and +5 volts. (Airway gas sensor failure is applied, see also chapter Special Indications).

Resp: The original scale -5000 mohms is scaled between -5 and +5 volts.

RR: RR display 0 to 150 breaths per minute are scaled between 0 and +1.5 volts.

T1, T2, T3, T4 (Temperature): The original scale 0 degrees...50 degrees Celcius is scaled between 0 and +5 volts.

TEST SIGNALS -5 V, 0 V, +5 V: Steady signals with one of the listed values.

TEST 1: Test signal of a triangle shape with base width of 1 second, min value of 0 volt and max value of 5 volts.

TEST 2: Test signal of a triangle shape with base width of 4 seconds, min value of -5 volts and max value of +5 volts.

### 4.8.3 Setting the Analog Output Signals

Set the analog output signals according to the following procedure.

1. Press the **Monitor Setup** key .
2. Select ***Install/Service*** and enter the password (16-4-34) to get into the corresponding menu.
3. Select ***Analog Outputs*** to get into the corresponding menu and combine a required channel with an output signal.
4. Press the **Normal Screen** key.

## 4.9 Pressure Temp Module, M-PT Output Signals

The signal output connector on the Pressure Temp Module, M-PT can be used to interface some models of IABPs to the Anesthesia Monitor/Critical Care Monitor. The pin assignments are illustrated in table 4-12. Please contact your local distributor for more information.

**WARNING** **Always make sure that the combination complies with the international safety standard IEC 60601-1-1 for medical electrical systems and with the requirements of local authorities.**

**Table 4 Signal Output Connector Pin Assignments**

| Pin | Signal |
|---|---|
| 1 | ECG out, ECG1 |
| 2 | Pressure out, P3 |
| 3 | ECG out, ECG1 |
| 4 | Ground |

### 4.9.1 Analog Outputs

The analog output signals are:

**ECG (ECG1)**

The ECG signal is 1 V/1 mV with a delay of approximately 10 ms. The signal requires an input impedance of 100 kΩ.

**NOTE:** The ECG signal is based on the ECG measurement of the ESTPR Module, M-ESTPR (all variations), and of the NESTPR Module, M-NESTPR (all variations). ECG signal from the module is channel 1 (ECG1). The channels 2 and 3 (ECG2, ECG3) are not transmitted. Make sure that the signal in channel 1 (ECG1) is good enough (extensive QRS for IABP synchronization). For further information, please contact your authorized Datex-Ohmeda distributor.

**Invasive Pressure (P3)**

The Invasive pressure output signal is 1 V/100 mmHg originally ranging from 0 to 300 mmHg and with a delay of approximately 25 ms. The signal requires an input impedance of 100 kΩ.

# 5 FUNCTIONAL CHECK

This instruction includes procedures for a functional check for Datex-Ohmeda AS/3 Compact Monitor and CS/3 Compact Monitor running with the S-__99(A) software. However, most of the procedures also apply to monitors with older monitor software.

The functional check is recommended to be performed after monitor installation.

Perform the procedures in the ascending order and skip the items that do not correspond to the particular monitor.

The instructions include a check form (*Appendix A*) to be filled in when performing the corresponding procedures.

The symbol in the instructions means that the performed procedure should be signed in the check form.

## 5.1 Recommended tools

| Tool | Order No. | For product(s) |
|---|---|---|
| Sampling line 2.0 m | 73318 | Compact Airway Module, M-COVX/-CAiOVX |
| $SpO_2$ finger probe | SAS-F4 | Hemodynamic modules w/ (S) |
| Adult NIBP cuff | 572435 | Hemodynamic modules w/ (NIBP) |
| Adult NIBP hose | 877235 | Hemodynamic modules w/ (NIBP) |
| Nellcor $SpO_2$ probe | - | M-NSAT |
| Earphones | - | M-EEG |
| Tonometrics™ catheter | | M-TONO |
| MemCard - Menu | - | M-MEM |
| MemCard - Data | - | M-MEM |
| Screwdriver | - | All |

## 5.2 Visual inspection/preparation

- Make sure that the monitor is turned off.
- Disconnect the mains power cord and press the service reset- switch until the LED next to it turns off.
- If the monitor is connected to the Datex-Ohmeda network, disconnect the Mon-Net cable from the monitor's Network extension cable. If the Memory Board, B-CMNET or the Memory Module, M-MEM, is connected, remove any memory cards.

## General

1. Check the external parts:
   - All the four rubber pads under the monitor are in place.
   - All the stickers are intact.
   - The LCD screen is intact.
   - The ComWheel cover is intact and attached properly.
   - The ON/STBY -switch and it's protector are intact and attached properly.
   - All connectors are clean and intact.
   - The thumb screws for cables on PC boards are intact.
   - The software card slot is covered with a lid (B-CMCPU4).
   - The service reset- switch is intact.
   - The handle is attached properly.
   - The outer cover is intact

2. Check that modules go in smoothly and lock up properly in all module slots.

## Anesthesia Keyboard, K-ARK

3. Check external parts:
   - the anesthesia keyboard plastic frame is intact
   - the front panel stickers are intact
   - the ComWheel cover is intact and is attached properly
   - all four rubber pads are in place on the bottom cover

   Check the anesthesia keyboard interface cable:
   - the cable is intact
   - the cable is connected and locked properly

## Remote Controller, K-REMCO

4. Check external parts:
   - the remote controller plastic frame is intact
   - the keypad is intact
   - the ComWheel cover is intact and attached properly
   - the screws at the bottom are tightened properly

   Check the remote controller interface cable:
   - the cable is intact
   - the cable is connected and locked properly

### Compact Airway Module, M-CXXXXX

5. Disconnect the module and check external parts:
   - the front cover and the front panel stickers are intact
   - all connectors are intact and are attached properly
   - the D-fend latch moves properly
   - the module box is intact
   - the module latch is intact and moves properly

   Plug the module back into the monitor.

### Tonometry Module

6. Disconnect the module and check the external parts:
   - the front cover and the front panel sticker are intact
   - connectors are intact and are attached properly
   - the module box, latch and spring locking pin are intact

   Plug the module back into the monitor.

### Other plug-in modules and N-EEG

7. Unplug the modules one by one and check external parts:
   - the front cover and the front panel sticker are intact
   - all connectors are intact
   - all mechanical parts are functioning properly
   - the module box and the latch are intact
   - the module bus connector is clean and intact

   Plug the modules back into the monitor.

8. Check external parts of the EEG Headbox, N-EEG and connect the EEG Headbox to the EEG Module.

## 5.3 Functional Inspection

### Start up

9. Connect the mains power cord to the Frame.
   Check that the stand-by LED is lit .

10. Check that the fans start running.

11. Turn the monitor on. Check that the monitor starts up properly, i.e.
    - the alarm LED's turn on and off
    - the start-up sound is heard from the loudspeaker
    - the normal monitoring screen appears
    - no error messages appear onto the screen
    - If the monitor contains a recorder, two lines of start-up information should be recorded.

### Monitor setup

12. Configure the monitor screen so that all required parameter information is displayed:

    **Monitor Setup** - ***Screen 1 Setup - Waveform Fields***
    ***- Digit Fields***

    Check that all of the connected modules are recognized, i.e. the required parameter information is displayed on the screen.

    NOTE: The InvBP waveform is not displayed if the InvBP cable is not connected

    If some parameter information is missing, check that the interfacing settings are correct:
    **Monitor Setup** - ***Install/Service*** (Password 16-4-34)
    ***Installation - Interfacing.***

13. Preset the measurement settings for the connected parameters, for examples:

    **Monitor Setup** - ***Screen 1 Setup - Digit Fields -Lower Field 4 - PgCO$_2$***

    **Others** - ***EEG - EEG Setup - Numeric 1 - MF***
    ***- Numeric 2 - Ampl.***
    ***- Montage - EEG Channels - 4***
    ***- Montage type - Bip***
    ***- EP - Cycle - Cont.***
    ***- EP Size - 1***
    ***- AEP Setup - AEP Channels - 2***

*- Responses -100*
*- Stim. Frequency - 1.1Hz*
*- Stim. Intensity - 90 dB*
*- Sweep length - 100 ms*

**Record/ Print** *- Record Waveforms - Waveform 1 - ECG1*
*- Waveform 2 - P1*
*- Waveform 3 - P2*

**ECG** *- ECG Setup - HR Source - AUTO*

**Invasive Pressures** *- P1 'ART' Setup - Label - ART*
*- P2 'CVP' Setup - Label - CVP*
*- P3 Setup - Label - PA*
*- P4 Setup - Label - P4*
*- P5 Setup - Label - P5*
*- P6 Setup - Label - P6*

S-ANE99(A)
L-ARK99(A)

**Pulse Oximetry** *- Pleth Scale - AUTO*

**Airway Gas** *- Spirometry Loops - Scaling - Indep.*
*- Paw Scale - 20*
*- Flow Scale - 15*

**Others** *- C.O. - C.O. Setup - Scale - 1.0 °C*
*- Injectate Volume - 10 ml*
*- Measurement Type - Set*
*- SvO2 - Update HB - 115 g/l*

S-ICU99(A)

**Others** *- SPO2 Setup - Pleth Scale - AUTO*

**Ventil.** *- Spirometry Setup - Scaling - Indep.*
*- Paw Scale - 20*
*- Flow Scale - 15*

**Wedge C.O: SVO2** *- C.O. View - C.O. Setup - Scale - 1.0 °C*
*- Injectate Volume - 10 ml*
*- Measurement Type - Set*
*- SvO2 - Update HB - 115 g/l*

**Others** *- NMT - Stimulus Mode - TOF*
*- Cycle Time - 10 sec*
*- NMT Setup - Current - s(70mA)*
*- Pulse Width - 200 µs*
*- Stim. Beep Volume - 2*
*- - Resp Setup - Size - 1.0*
*- Resp Rate Source - AUTO*
*- Measurement - ON*
*- Detection Limit - AUTO*

## LCD display

14. Check that the picture on the LCD display screen is clear and stable.

Press **Monitor Setup** key and select:
***Install/Service*** (password 16-4-34)***- Service*** (password 26-23-8) ***- Display***
Select ***Colors*** and check that all colors are clear.

Press the ComWheel and return to the ***Install/Service*** menu by selecting ***Previous Menu*** twice.

15. Monitors with software S-_97 and F-CM(REC) Rev 03 or F-CMC(REC) Rev 00 or newer: Check the LCD display screen setup:

***Installation - Display Setup - LCD Colors.***

Check that the menu and digit field background colors change between the settings 8 and 16. Return the original setting.

## Command Board / Anesthesia Keyboard

16. Press the **Help** key. Check that the key opens the corresponding menu on the screen.
Turn the ComWheel in both directions and check that the cursor in the menu moves correspondingly.
Highlight ***Normal Screen***, press the ComWheel and check that the menu disappears from the screen.

17. Check the Command board membrane keys, and the corresponding keys on the Anesthesia keyboard, if connected.
Press the keys one by one. Check that each key generates a sound from the loudspeaker and the corresponding text in Service Data changes its color.

## Remote Controller

18. Press the **Menu** key. Check that the key opens the corresponding menu on the screen.
Turn the ComWheel in both directions and check that the cursor in the menu moves correspondingly.
Highlight ***Normal Screen***, press the ComWheel and check that the menu disappears from the screen.

## Compact Monitor Frame

19. Check that the clock on the screen shows correct time.

    If necessary adjust the time:

    **Monitor Setup** - ***Time and Date***

    NOTE: You cannot change the monitor's time after a case has started. This prevents losing the trend data.

    NOTE: If the clock time shows 0:00 continuously (at successive start-ups), the SRAM/TIMEKEEPER chip on the CPU Board, or its battery, needs to be replaced. The ***Factory Reset*** should be performed if the chip or battery is replaced.

20. Check the loudspeaker by setting the alarm sound:

    **Alarms Setup** - ***Alarm Volume***

    Test the whole volume scale from 1 to 10 by turning the ComWheel and check that the alarm volume changes correspondingly. The alarm sound should be clear and audible at all settings.

21. Preset the battery settings:

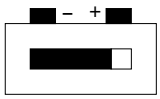
    **Monitor Setup** ***- Battery Setup - Charging Speed - Normal***
    ***- LCD Brightness- Bright***
    ***- Install/Service*** (password 16-4-34) **-**
    ***Service*** (password 26-23-8) ***- Frame - Power Supply - Battery***

    Check that the following values are within the given limits:

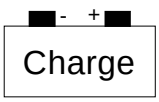
    | | |
    |---|---|
    | "Temperature (C)" | 20-40 |
    | "Voltage (V)" | 20-32 |

    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check also that the Battery Supervisor Board (BSB) memories have passed the internal memory test, i.e. the "RAM", "ROM" and "EEPROM" all state OK.

22. Disconnect the power cord (without turning the monitor standby) and check, that the battery indicator appears onto the upper right hand corner of the screen:

    Reconnect the power cord and check that during charging, the charging symbol is displayed:

## Compact Airway Module

23. Check that the fan is running.

24. Select the pressure and the flow waveform on the monitor screen:

**Monitor Setup** - ***Screen 1 Setup - Waveform Fields - Field 5 - Paw - Field 6 - Flow***

| | |
|---|---|
| S-ANE99(A)<br>L-ARK99(A) | **Airway Gas** - ***Agent/N2O Setup - Agent Measurement - ON - Spirometry Loops - Scaling - Indep. - Paw Scale - 20 - Flow Scale - 15*** |

| | |
|---|---|
| S-ICU99(A) | **Ventil.** - ***Spirometry Setup - Scaling - Indep. - Paw Scale - 20 - Flow Scale - 15*** |

Wait until the message 'Calibrating gas sensor' disappears from the screen, then enter the ***Airway Module*** service menu:

**Monitor Setup** - ***Install/Service*** (password 16-4-34) - ***Service*** (password 26-23-8) - ***Parameters - Gas Unit - General***

Check that the module configuration displayed corresponds with the Compact Airway Module type being used.

25. Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second.
A value increasing faster than this indicates a failure in Module Bus communication.

26. Enter the ... ***Gas Unit - Gases*** service menu.

Check that the 'Ambient' value displayed corresponds with the current ambient pressure (±20 mmHg)

27. Check that the flow measurement offset, i.e. the sample 'Zero' value displayed is within ±10 ml/min.

28. Check that the 'Amb-Work' value in the service menu is within the following range:

| | M-COVX/CAiOVX | Others |
|---|---|---|
| Amb-Work (mmHg) | 70-115 | 40-75 |

29. Block the tip of the sampling line with your finger and check that the message 'Sample line blocked' appears on the monitor screen within 30 seconds.

30. Detach the D-fend and check that the messages 'Check D-fend' appears on the monitor screen within 30 seconds.

31. Breath shortly into the sampling line.
Check that the $CO_2$ waveform moves up the screen.

## Tonometry Module, M-TONO

32. Enter the tonometry module service menu:

**Monitor Setup** - ***Install/Service*** (password 16-4-34) -
***Service*** (password 26-23-8)...***Parameters - More - TONO***

Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the memories of the module have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all state OK. Check that the general error status, module pneumatics error status, module hardware error status and testbit status are zero.

33. Connect the catheter to the tonometry module. Start tonometric measurement by pressing the **Start-Stop** key on the module.
If measurement is turned on PgCO2 time bat replaces the Meas Off text. Check that the catheter fills up. Stop the measurement by pressing the **Start-Stop** key. Check that Meas. Off text appears on the digit field.

## Hemodynamic Modules

### ECG measurement

34. Enter the ***ESTP : ECG*** service menu:

    **Monitor Setup** - ***Install/Service*** (password 16-4-34) **-**
    ***Service*** (password 26-23-8) **- *Parameters - ESTP : ECG***
    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the ECG/RESP board memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all state OK.

35. Check the module membrane key **ECG LEAD** (not available in NE12STPR/NESTPR type modules).
    Press the key at least for two seconds. Check that the selected ECG lead is changing on the screen and the state for 'Button' in the service menu.

36. Check that the module mains power frequency 'Power Freq' value has been set according to the supply frequency. If necessary change the setting by selecting ***Power Freq***.

### For modules w/ respiration measurement

37. Check on the ***ESTP : ECG*** service menu that the 'Resp Available' and 'RESP Measurement' show ***ON***

### For modules w/ temperature measurement

38. Enter the ***ESTP : STP*** service menu:

    MODULES - ESTP : STP

    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the STP board memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show OK.

39. Check that the protection for temperature calibration is on, and the module configuration is set correctly.

    The 'Protect key' text in the menu should state ***OFF*** and the 'Protect mode' text should state ON.

The configuration in use is shown next to the 'Configuration' text and it may be either ***STP***, ***ST*** or ***TP***.

If necessary change the protection mode, or the module configuration on the ***Calibrations*** -menu.

**For modules w/ invasive blood pressure measurement**

40. Check the module membrane keys that are related to the InvBP or temperature measurement:
Press each of the keys for at least one second. Check on the service menu that the key being pressed is identified, i.e. one of the texts for 'Buttons' changes from ***OFF*** to ***ON*** .

**For modules w/ $SpO_2$ measurement**

41. Check that the message 'No probe' is shown when an $SpO_2$ sensor is not connected. Connect a $SpO_2$ finger probe to the module. Check that the message 'Probe off' is shown when the probe is not connected to a finger.

42. Attach the $SpO_2$ probe to your finger. Check that a reading of 95-99 and a $SpO_2$ waveform appear. Check that the HR value is calculated from $SpO_2$ when ECG and InvBP (P1) cables are not connected.

**For modules w/ non invasive blood pressure measurement**

43. Enter the ***NIBP*** module service menu:

**Monitor Setup** - ***Install/Service*** (password 16-4-34) **-** ***Service*** (password 26-23-8) **- *Parameters - NIBP***

Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the NIBP board memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show ***OK***.

44. Check the module membrane keys.

Press each of the two NIBP related membrane keys twice. Check that the NIBP pump turns on for a short time in both cases.

45. Attach an adult NIBP cuff onto your arm and perform one NIBP measurement. Check the module identifies the cuff, i.e. the text 'Adult' appears in the NIBP digit field for a short time.

    Check that the module gives a reasonable measured result.

## EEG Module, M-EEG and EEG Headbox, N-EEG

46. Enter the EEG module service menu:

    **Monitor Setup** - ***Install/Service*** (password 16-4-34) **-**
    ***Service*** (password 26-23-8) - ***Parameters - More... - EEG & EP***

    Select ***Module***.
    Check that the 'Mod Mon Timeouts', 'Mod Mon Bad checksums' and 'Mon Mod Bad checksums' values in the module view are not increasing faster than by 50 per second.
    Check that the memories of the module have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all state OK.

47. Plug in the earphones to the headbox. Be careful with load stimulation from the earphones when starting AEP stimulation. Start AEP stimulation by pressing the **EP Start/Stop** key on the module. Check that the clicking sound comes from the earphones in 1.1 Hz frequency. Stop the stimulation by pressing again the **EP Start/Stop** key on the module. Check that the clicking stopped.

## Pressure/Pressure Temp Modules, M-P/-PT

48. Enter the ***P/PT*** module service menu:

    **Monitor Setup** - ***Install/Service*** (password 16-4-34) **-**
    ***Service*** (password 26-23-8) **- *Parameters - P/PT***

    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the PT board memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show ***OK***.

### Invasive blood pressure measurement

49. Check the module membrane **Zero P3** key.
    Press the key for at least one second. Check that the key being pressed is identified, i.e. the text in the service menu for 'Button' changes from ***OFF*** to ***ON***.

50. Check that the module configuration is set correctly. The configuration in use is displayed next to the 'Configuration' text in the service menu and it can be either ***BP*** or ***PT***. If necessary, change the configuration in the ***Calibrations*** -menu.

**For modules w/ temperature measurement**

51. Check that the protection for temperature calibration is on.

The 'Protect key' text in the menu should state ***OFF*** and the 'Protect mode' text should state ***ON***.
If necessary change the protection mode in the ***Calibrations*** -menu.

## Dual pressure Module, M-PP

52. Enter the ***PP*** module service menu:

**Monitor Setup** - ***Install/Service*** (password 16-4-34) -
***Service*** (password 26-23-8) ***- Parameters - PP***

Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the Dual Pressure module, M-PP, memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show ***OK***.

53. Check the module **Zero P5** and **Zero P6** membrane keys.
Press each of the keys for at least for second. Check that the key being pressed is identified, i.e. one of the texts in the service menu for 'Button' changes from ***OFF*** to ***ON***.

## Cardiac Output Modules, M-COP/-COPSv

54. Enter the ***COP*** module service menu:

**Monitor Setup** ***- Install/Service*** (password 16-4-34) ***-***
***Service*** (password 26-23-8) ***- Parameters - COP***

Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the module's memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show ***OK***.

#### Invasive blood pressure measurement

55. Check the module membrane **Zero P4** key.
Press the key for at least one second. Check that the key being pressed is identified, i.e. the information on the service menu under 'Button' - 'P4' changes from ***OFF*** to ***ON***.

#### $SvO_2$ measurement

56. Check that the $SvO_2$ values 'Meas. state', 'OM fail' and 'OM temp.' in the ***COP*** module service menu all show ***NO OM***.

#### Cardiac Output measurement

57. Check the **Start C.O.** module membrane key.
Enter the ***COP*** module service menu. Press the key for at least one second and check that it is identified, i.e. the information in the service menu under 'Button' - 'C.O.' changes from ***OFF*** to ***ON***.

## NIBP module, M-NIBP

58. Enter the NIBP module service menu:

**Monitor Setup** - ***Install/Service*** (password 16-4-34) -
***Service*** (password 26-23-8) ***- Parameters - NIBP***

Check that the Timeouts, Bad checksums and Bad c-s by mod values are not increasing faster than by 50 per second. Check that the NIBP board memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all show ***OK***.

59. Select ***Pneumatics***.

Press the ComWheel twice. The NIBP pump should turn on and off.

60. Check the module front panel LEDs and membrane keys using the ***Buttons/Leds*** service menu:

***Parameters - NIBP - Buttons/Leds***

Highlight the ***Auto ON*** text. Check that the module front panel LED for the autocycle measurement turns on and off when the ComWheel is pressed. Check the other LEDs by selecting ***Manual ON***, ***Stat ON*** and ***Measur. ON***.

Press each membrane key on the module front panel for at least one second. Check that the key being pressed is identified in the menu, i.e. text ***OFF*** changes to ***ON***.

61. Attach an adult NIBP cuff onto your arm and perform one NIBP measurement. Check the module identifies the cuff, i.e. the text 'Adult' appears on the NIBP digit field for a short time.

    Check that the module gives a reasonable measured result.

## NeuroMuscular Module, M-NMT

62. Enter the ***NMT*** module service menu:

    **Monitor Setup** ***- Install/Service (password 16-4-34) - Service (password 26-23-8) - Parameters - NMT***

    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the module's memories have passed the internal memory test, i.e. 'RAM', 'ROM' and 'EEPROM' all state *OK*.

63. Check the module membrane **Start-Up** and **Stop/Continue** keys.
    Press each key for at least one second and check that the key being pressed is identified, i.e. the color under the corresponding text in the menu turns blue.

## Nellcor Compatible Saturation module, M-NSAT

64. Enter the ***M-NSAT*** service menu:

    **Monitor Setup** ***- Install/Service*** (password 16-4-34) ***- Service*** (password 26-23-8) ***- Parameters - M-NSAT***

    Check that the 'Timeouts', 'Bad checksums' and 'Bad c-s by mod' values are not increasing faster than by 50 per second. Check that the NSAT module's ROM memory has passed the internal memory test, i.e. 'ROM' shows ***OK***.

65. Check that the $SpO_2$ probe related status information in the menu is correct. Only the 'NoProbe' should be active (1) when no probe is connected.

66. Check that all three error indicators, 'MP-203(4) Error', 'QUART Error' and 'I/O Error' show ***NO***.

67. Connect a Nellcor $SpO_2$ finger probe to the module. Check that the message 'Pulse search' is shown and the corresponding status information in the menu is active. Check that the shown message changes to 'Check probe' within 30 seconds.

68. Attach the $SpO_2$ probe on your finger. Check that a reading of 95-100 and a proper $SpO_2$ waveform appear.

## Recorder unit/ Recorder Module, M-REC

69. Open the paper compartment cover. Check that the message 'Recorder: Cover open' appears on the screen, then close the cover.

70. Press the **Record Wave** key on the recorder and check that the recorder starts recording the selected waveforms. Press the **Stop** key to stop recording.

    NOTE: If no recording appears, check that the paper roll is installed correctly. Only one side of the paper is printable.

    NOTE: The invasive blood pressure waveforms are not recorded if the InvBP cable is not connected.

    Press the **Print Trends** key on the recorder and check that the recorder starts recording trends. Press the **Stop** key to stop recording.

71. Check that the quality of the recordings is acceptable.

## Memory Board, B-CMMEM/ Memory Module, M-MEM

72. Enter the ***MemCards*** service menu:

    **Monitor Setup** - ***Install/Service*** (password 16-4-34) **-** ***Service*** (password 26-23-8) **- *Frame - MemCards***

    Check that the module is recognized properly, i.e. 'Present' and 'Active' state ***YES***.

73. Check that the Memory board memories and the PCMCIA controller have passed the tests. The status for each should be ***OK***.

74. Select ***Communication***.

    Check that 'Interface status' states ***Active*** continuously and the error counter values on the bottom part of the menu are stable.

75. Select ***Status***.

    Insert the Memory card labeled 'Menu' in the left-hand side memory card slot. Check that the message 'Menu Card inserted' appears onto the message field and the white menu card symbol on the upper right hand corner of the screen appears within 1 minute.

    Wait until the information regarding SLOT1 is fully updated in the service menu then check that the 'Card type' states ***MENU*** and the 'File system' ATA.

    Check that the rest of the information for SLOT1 is reliable and no errors have been detected.

76. Insert the Memory card labeled 'Data' in the right-hand side memory card slot. Check that the message 'Data Card inserted' appears onto the message field and the green menu card symbol on the upper right-hand corner of the screen appears within 1 minute.

    Wait until the information regarding SLOT2 is fully updated in the service menu then check that the 'Card type' states ***DATA*** and the 'File system' ATA.

    Check that the rest of the information for SLOT2 is reliable and no errors have been detected.

77. Press the **Display Trends** membrane key/ **Pt Data & Trends** key and select ***Trends.*** Check that there is enough trend information available for the monitored parameters.

Erase the trends:

| | |
|---|---|
| S-ANE99(A)<br>L-ARK99(A) | **Reset Case** - ***Reset ALL - YES*** |
| | Check that the trends have been erased by pressing the **Display Trends** key again.<br><br>Reload trends from the Data card by pressing the **Patient Data** key, selecting ***Load Prev. Case***, pressing the ComWheel on the last saved file (the file information is shown at the bottom of the menu) and selecting ***Load***.<br><br>Wait until the message 'Loading from Mem. Module' disappears then check that trend information is available again by pressing the **Display Trends** key. |

| | |
|---|---|
| S-ICU99(A) | **Admit/ Discharge**- ***Discharge - YES*** |
| | Check that the trends have been erased by pressing the **Pt Data & Trends** key and selecting ***Trends.***<br><br>Reload trends from the Data card by pressing the **Admit/ Discharge** key, selecting ***Admit Patient - Patient from Card,*** pressing the ComWheel on the last saved file (the file information is shown at the bottom of the menu) and selecting ***Load***.<br><br>Wait until the message 'Loading from Mem. Module' disappears then check that trend information is available again by pressing the **Pt Data & Trends** key. |

## Network Board, B-NET/ B-CMNET/ B-UPINET

78. Check that the Mon-Net cable connector and the Identification plug are clean and intact, then connect them to the Network Board.

Check that the monitor connects to the Datex-Ohmeda Network, i.e. the network symbol appears under the clock on the upper right-hand corner of the screen. Also a message regarding the connected Datex-Ohmeda Central should appear in the message field on the screen.

NOTE: During battery operation the battery symbol overrides the network symbol.

NOTE: If the network symbol does not appear, check the status of the network.

79. Check the communication to the network by checking the states of the Network Board rear panel LEDs:

    TxD (Green); should blink intermittently
    RxD (Yellow); should blink intermittently
    L (Green); should be lit continuously
    C (Yellow); should be lit continuously

    NOTE: The B-UPINET board doesn't have LEDs.

80. Enter the ***Network*** service menu:

    **Monitor Setup** ***- Install/Service*** (password 16-4-34) ***-***
    ***Service*** (password 26-23-8) ***- Frame - Network***

    Check that the counters for data errors ('CRC', 'Frame', 'Transm.') are stable.

    NOTE: The counters may show values greater than 0. However, any values increasing continuously indicates a problem.

81. Check that the counters for hardware errors ('Intern.', 'Missed', 'FIFO', 'Overrun') all show 0. If any of the counters show a value greater than 0, replace the Network Board.

82. Turn the monitor off and perform final cleaning.

- Fill in all necessary documents.

# 6 GENERAL TROUBLESHOOTING

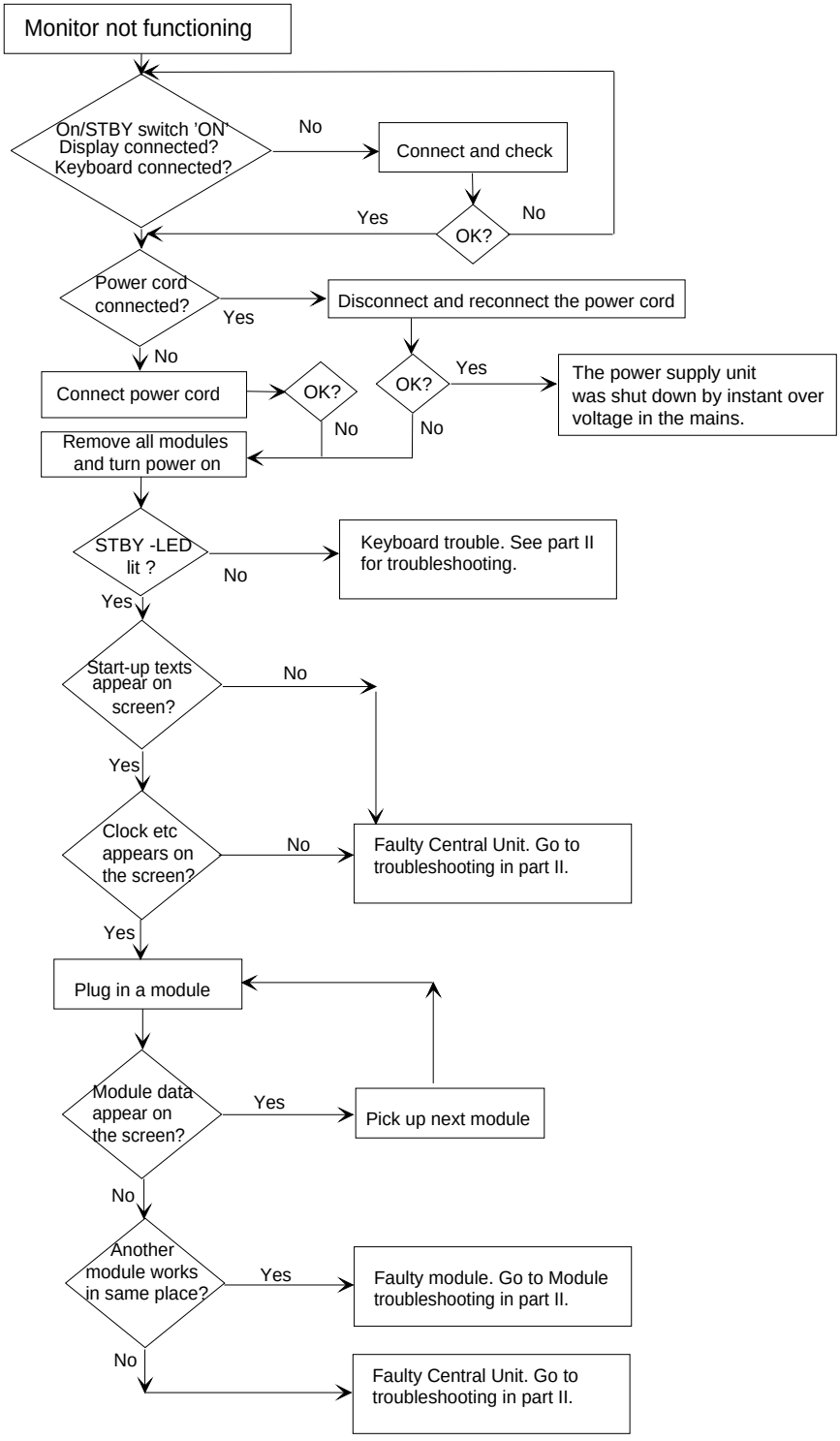



**Figure 15 Monitor General Troubleshooting Flowchart**

# APPENDIX A

# FUNCTIONAL CHECK FORM

## Datex-Ohmeda AS/3 Compact Monitor, CS/3 Compact Monitor

Customer _____

Service _____

Service engineer _____ Date _____

### Monitor installation

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F-CM | _____ | B- | _____ | M- | _____ | | _____ |
| S- | _____ | B- | _____ | M- | _____ | | _____ |
| B- | _____ | K- | _____ | M- | _____ | | _____ |

☐ OK = Test OK ☐ N.A. = Test not applicable ☐ Fail = Test Failed

### Visual inspection/preparation

| **Displays** | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 1. External parts | ☐ | ☐ | ☐ | 2. Module motherboard position | ☐ | ☐ | ☐ |

Notes _____

| **Keyboards** | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 3. Anesthesia Keyboard | ☐ | ☐ | ☐ | 4. Remote Control | ☐ | ☐ | ☐ |

Notes _____

**Compact Airway Module** S/N

| | OK | N.A. | Fail |
|---|---|---|---|
| 5. External parts | ☐ | ☐ | ☐ |

Notes _____

**Tonometry Module** S/N

| | OK | N.A. | Fail |
|---|---|---|---|
| 6. External parts | ☐ | ☐ | ☐ |

Notes

**Other plug in modules and EEG Headbox, N-EEG** S/N S/N S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 7. External parts | ☐ | ☐ | ☐ | 8. N-EEG | ☐ | ☐ | ☐ |

Notes

## Functional inspection

**Start up**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 9. Stand-by LED(s) | ☐ | ☐ | ☐ | 10.Fan | ☐ | ☐ | ☐ |
| 11.Start-up | ☐ | ☐ | ☐ | | | | |

Notes

**Monitor setups**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 12. Recognition of modules | ☐ | ☐ | ☐ | 13. Monitor setup | ☐ | ☐ | ☐ |

Notes

**LCD Display** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 14.Picture | ☐ | ☐ | ☐ | 15.LCD Colors | ☐ | ☐ | ☐ |

Notes

**Command Board/Anesthesia Keyboard**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 16.ComWheel | ☐ | ☐ | ☐ | 17.Membrane keypad | ☐ | ☐ | ☐ |

Notes

**Remote Controller** S/N

| | OK | N.A. | Fail |
|---|---|---|---|
| 18.ComWheel | ☐ | ☐ | ☐ |

Notes

**Compact Monitor Frame**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 19.Real-time clock | ☐ | ☐ | ☐ | 20.Loudspeaker | ☐ | ☐ | ☐ |
| 21.Battery status | ☐ | ☐ | ☐ | 22. Battery operation | ☐ | ☐ | ☐ |

Notes

**Compact Airway Module** S/N

**General**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 23.Fan | ☐ | ☐ | ☐ | 24.Configuration | ☐ | ☐ | ☐ |
| 25.Communication | ☐ | ☐ | ☐ | 26.Ambient pressure | ☐ | ☐ | ☐ |

| | | |
|---|---|---|
| 27. Flow measurement offset | | ±10 ml/min |

28.Working pressure

| | | |
|---|---|---|
| Amb-Work | | 40-75 mmHg |
| Amb-Work (M-COVX/CAiOVX) | | 70-115 mmHg |

**All Compact Airway Modules**

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 29.Occlusion detection | ☐ | ☐ | ☐ | 30.Air leak detection | ☐ | ☐ | ☐ |
| 31.$CO_2$ waveform | ☐ | ☐ | ☐ | | | | |

Notes

**Tonometry Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 32.Communication and memories | ☐ | ☐ | ☐ | 33. Measurement | ☐ | ☐ | ☐ |

Notes

**Hemodynamic Modules, M-NE(12)STPR etc.** | Module: | S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| **ECG measurement** | | | | | | | |
| 34.Test with TEMP plugs | ☐ | ☐ | ☐ | 35.Membrane key | ☐ | ☐ | ☐ |
| 36. Power frequency | ☐ | ☐ | ☐ | | ☐ | ☐ | ☐ |
| **RESP measurement** | | | | | | | |
| 37. Recognition | ☐ | ☐ | ☐ | | ☐ | ☐ | ☐ |
| **TEMP measurement** | | | | | | | |
| 38. Communication and memories | ☐ | ☐ | ☐ | 39. Protection and configuration | ☐ | ☐ | ☐ |
| **InvBP measurement** | | | | | | | |
| 40.Membrane keys | ☐ | ☐ | ☐ | | ☐ | ☐ | ☐ |
| **$SpO_2$ measurement** | | | | | | | |
| 41.$SpO_2$ probe detection | ☐ | ☐ | ☐ | 42.Test measurement | ☐ | ☐ | ☐ |
| **NIBP measurement** | | | | | | | |
| 43.Communication and memories | ☐ | ☐ | ☐ | 44.Membrane keys | ☐ | ☐ | ☐ |
| 45.Test measurement and cuff identification | ☐ | ☐ | ☐ | | | | |

Notes

**EEG Module and EEG Headbox** | S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 46.Communication and memories of module | ☐ | ☐ | ☐ | 47.AEP stimulation | ☐ | ☐ | ☐ |

Notes

**P / PT Module** | S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 48.Communication and memories | ☐ | ☐ | ☐ | | | | |
| **InvBP measurement** | | | | | | | |
| 49.Membrane key | ☐ | ☐ | ☐ | 50.Configuration | ☐ | ☐ | ☐ |
| **TEMP measurement** | | | | | | | |
| 51.Calibration protection | ☐ | ☐ | ☐ | | | | |

Notes

**PP module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 52.Communication and memories | ☐ | ☐ | ☐ | 53.Membrane keys | ☐ | ☐ | ☐ |

Notes

**COP/COPSv module** S/N

| | OK | N.A. | Fail |
|---|---|---|---|
| 54.Communication and memories | ☐ | ☐ | ☐ |
| **InvBP measurement** | | | |
| 55.Membrane key | ☐ | ☐ | ☐ |
| **$SvO_2$ measurement** | | | |
| 56.Service menu values | ☐ | ☐ | ☐ |
| **C.O. measurement** | | | |
| 57.Membrane key | ☐ | ☐ | ☐ |

Notes

**NIBP Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 58.Communication and memories | ☐ | ☐ | ☐ | 59.NIBP pump | ☐ | ☐ | ☐ |
| 60.LEDs and membrane keys | ☐ | ☐ | ☐ | 61.Test measurement and cuff identification | ☐ | ☐ | ☐ |

Notes

**NMT Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 62.Communication and memories | ☐ | ☐ | ☐ | 63.Membrane keys | ☐ | ☐ | ☐ |

Notes

**NSAT Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 64. Communication and memories | ☐ | ☐ | ☐ | 65. $SpO_2$ probe status | ☐ | ☐ | ☐ |
| 66. Error status | ☐ | ☐ | ☐ | 67. $SpO_2$ probe detection | ☐ | ☐ | ☐ |
| 68. Test measurement | ☐ | ☐ | ☐ | | | | |

Notes _____

**Recorder unit/ Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 69. Recorder messages | ☐ | ☐ | ☐ | 70. Recording | ☐ | ☐ | ☐ |
| 71. Quality of recordings | ☐ | ☐ | ☐ | | | | |

Notes _____

**Memory Module** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 72. Recognition of module | ☐ | ☐ | ☐ | 73. Memories and PCMCIA controller | ☐ | ☐ | ☐ |
| 74. Communication | ☐ | ☐ | ☐ | 75. Menu Card recognition | ☐ | ☐ | ☐ |
| 76. Data Card recognition | ☐ | ☐ | ☐ | 77. Data transfer | ☐ | ☐ | ☐ |

Notes _____

**Network Board** S/N

| | OK | N.A. | Fail | | OK | N.A. | Fail |
|---|---|---|---|---|---|---|---|
| 78. Connection to Network | ☐ | ☐ | ☐ | 79. Communication | ☐ | ☐ | ☐ |
| 80. Data error counters | ☐ | ☐ | ☐ | 81. Hardware error counters | ☐ | ☐ | ☐ |

Notes _____

| **General** | OK | N.A. | Fail |
|---|---|---|---|
| 82.Final cleaning | ☐ | ☐ | ☐ |

Notes _____

**Notes** _____

**Signature** _____